Engineering News, December 7, 1961

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No. 10 December 7, 1961

ENGINEERING NEWS

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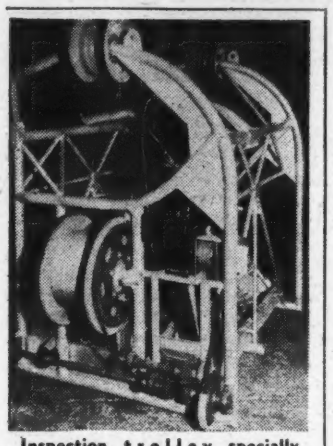
ANGLO-FRENCH POWER LINK



Inspection trolley specially designed to run on conductor cable.

SEVERN PROBLEM SOLVED

A SPECIALLY designed trolley has beaten the problem of inspecting a 5,301-ft. conductor cable which connects South Wales over the River Severn crossing to the 275,000 volt supergrid system.

This inspection trolley, believed to be the only one in the world, is powered by a small petrol driven motor and runs on the actual conductor cables.

Two drives

It is geared to a drum at the front of the trolley which winds in a cable anchored to a high level tower.

Safety precautions include a secondary method of propulsion—two manually operated units which are also geared to the cable drum.

The trolley was designed by Bowthorpe Engineering Co. and manufactured by J. L. Eve Construction Co.

Boost for peak hours

TOMORROW morning the cross-Channel power link between Britain and France will be officially opened.

The ceremony is to be performed jointly by the Minister of Power, Mr. Richard Wood, from the CEGB's control room at East Grinstead, and M. Jean-Marcel Jeanneney, Minister for Industry, from the control centre at Plessis Gassot near Paris.

The link stations are sited in Lydd, Kent and Echinghen near Boulogne.

D.C. system

This exchange link will make available to either country a maximum of 160 MW during peak consumption hours.

These vary in the two countries, and the extra power could only be obtained by building additional generating plant at considerably more than the joint £4½ million spent on the link.

Investigations into the scheme began in 1949, but it was not until 1956 that a joint committee recommended the use of a d.c. system.

The decision to operate a direct current system with 200,000 volts between poles was brought about by several factors.

Both the British and French systems are a.c. the former running at 275 kV and the latter at 225 kV—but frequencies differ considerably and synchronisation to avoid overloading would have been difficult.

For a.c. transmission without booster stations, a large charging

★ Back page, col. 6

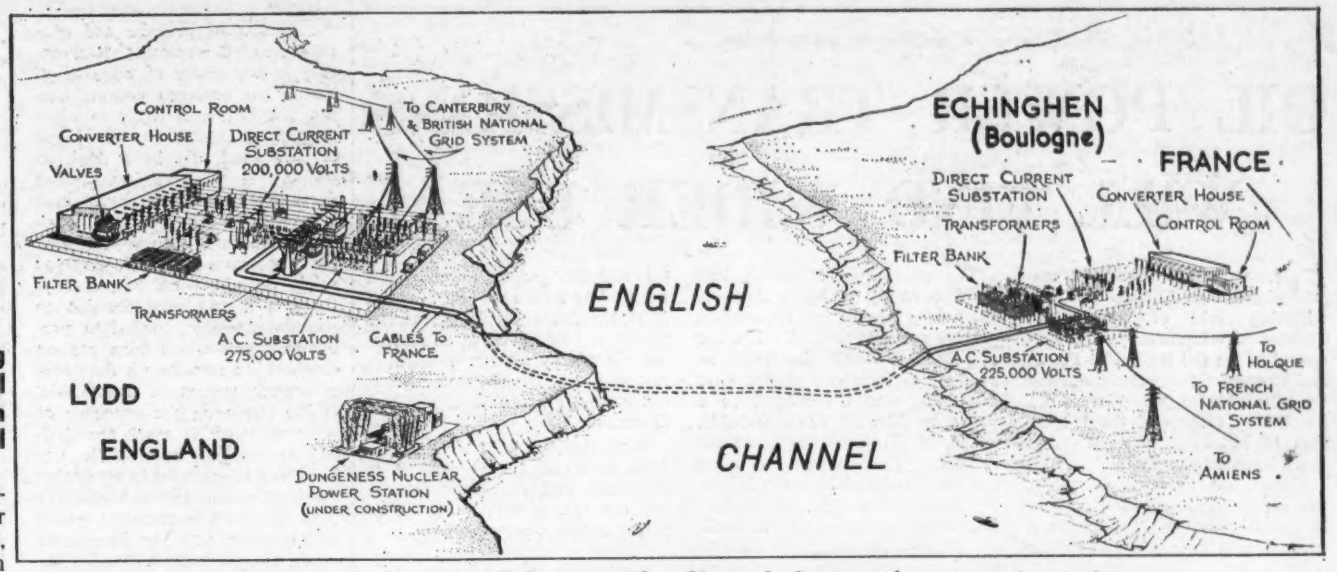


Diagram of the power link across the Channel showing the two main stations.

Indexing table shown in U.K.

AN automatic rotary machining table with a positional accuracy of ± 2 seconds of arc, developed jointly by EMI Electronics and Societe Genevoise d'Instruments de Physique (GSIP), had its first demonstration in the U.K. on Tuesday at Hayes, Middlesex.

This GSIP Rotoptic 6CN is a high precision 31½in. diameter dividing table fitted with EMIcon rotary positioning system, using circular inductors. Operation is by punched tape and servo control.

Auto checking

In addition to electronic control, the table can be supplied with optical measurement. The control equipment is fitted with a parity checking device which automatically ensures that the correct dimensions are read from the tape.

The table will support a static load evenly distributed of 2,200lb.

NOW IT'S A HOVERCAR!

BRITAIN'S hovercraft designers have started work on a 300 m.p.h. "Hovercar" transport system that could be in operation within four years. Heading the project is Christopher Cockerell, inventor of the Hovercraft, and a team of scientists from Hovercraft Development, a subsidiary of the National Research Development Corporation (NRDC).

The 150-passenger machine, weighing 43 tons, would run on a special shallow-vee track. Suspension system and lift pads would use jets to sustain the air cushions half an inch above the track. Estimated cost of the hovercar is £150,000.

The propulsion unit may be the linear electric induction motor. Experiments are being carried out under Dr. Eric Laithwaite at Manchester University, for the British Transport Commission.

Dr. Laithwaite already has an 80ft. test track on which a single seat wheeled truck can reach 25 m.p.h.

The hovercar could be used for fast City-to-city passenger services, or with higher passenger loading and lower speeds for underground hovertrains.

Speed-pumps for giant dry dock

PUMPS of advanced design will be used to fill and empty the new outsize dry dock being built at Greenock, on the Clyde.

They will embody a newly patented siphonic principle developed by Drysdale and Co., of Clydebank. Working to a bore of 60 inches and delivering 255,000 gal/min., the electrically driven pumps will be able to fill the dock in one and a half hours, and empty it in 2½.

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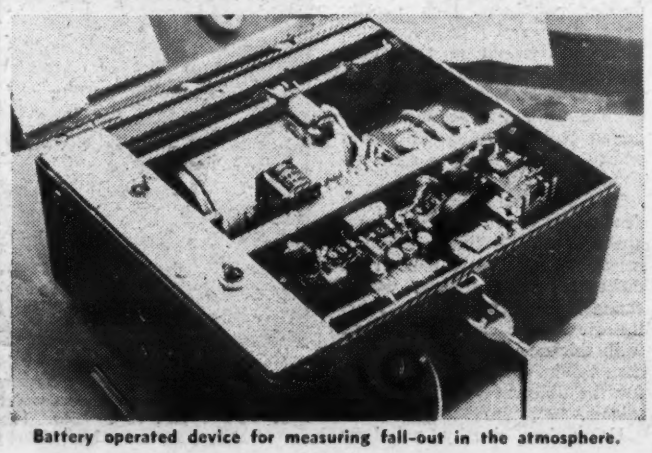
FALL-OUT RECORDER — £5



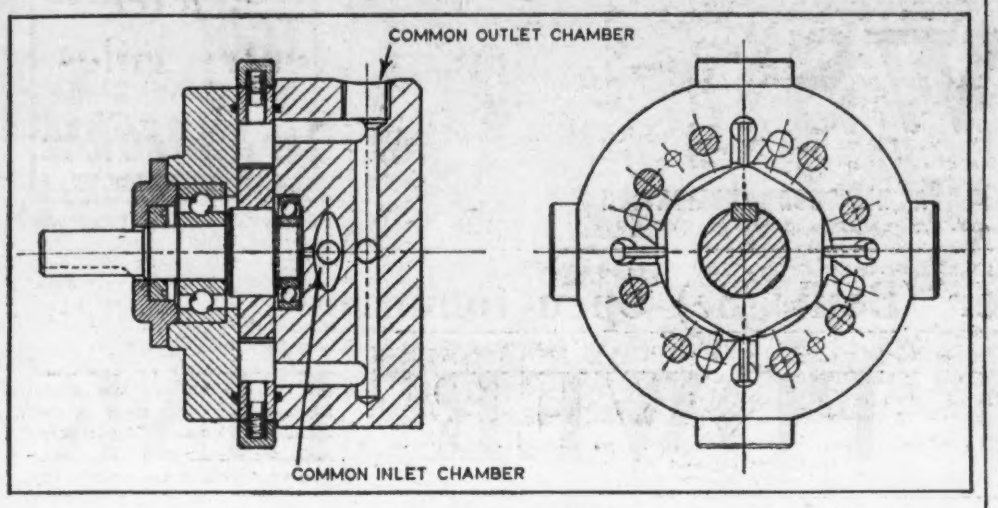
Battery operated device for measuring fall-out in the atmosphere.

A PORTABLE fall-out recorder built from war surplus electronic components costing about £5 was shown at the Doctors' Hobbies Exhibition which opened at B.M.A. House in London on Monday. The exhibition is the fifth in an annual series organised and sponsored by Benger Laboratories.

The recorder was made by Dr. M. J. Ball, of West Kensington.

Rainwater is collected in the instrument and ducted round a Geiger tube. The output from the tube is passed to a transistor amplifier and operates a pen recording the number of beta particles collected over an 8-day period on a rotating drum.

Hydraulics conference



A single-rotor pump design.

OIL POWER TRANSMISSIONS WILL FIND WIDER USE

OIL hydraulic power transmission is finding an ever widening field of application. Current developments were discussed at the Oil Hydraulic Power and Control Conference, arranged by the Hydraulic Plant and Machinery Group of the Institution of Mechanical Engineers at their headquarters recently.

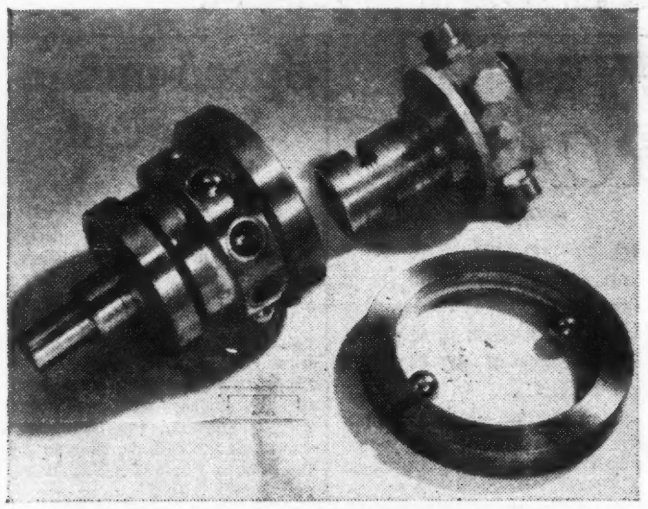
Since the early pioneering period, in the late 1900s, various forms of transmission have been evolved and in some cases their features are to be found in present-day arrangements. Notable developments have taken place since 1945. Mr. T. E. Beacham, consulting engineer, in his paper on historical developments, reviewed some of the early transmissions.

Over the past 15 years, he said, new types of swashplate mechanism have come into use. Fixed stroke types with rolling contact between swashplate and piston ends are extensively used as high pressure pumps for presses and high speed motors for aircraft controls.

Slipper type pumps

Another development during this period has been the variable stroke, slipper type swashplate pump. This eliminates the universal joints and at least half of the ball connections of original designs, consequently simpler construction and smaller size are possible. Extensive use is now made of high pressure hoses which simplifies the mechanical linkages in many types of mobile equipment, and the rubber sac accumulator, which permits the use of compressed gas for absorbing fluctuations without the disadvantages of a free liquid surface.

The possibility of using ball bearings as the pumping elements has a long history and the earliest patents go back to 1912. The use of standard ball bearings as pistons or plungers in hydrostatic machinery was the subject of a paper by Mr. D. Firth and Mr. R. H. Y. Hancock, both of the D.S.I.R. The authors reviewed the work undertaken at the N.E.L. to isolate the type of failure associated with the use of balls as pistons, to establish leakage rates and to examine the design factors controlling their life.



Ball pump/motor dismantled after 5,000 hours running time.

Of non-rotating and rotating reciprocating types tested the authors suggest that the latter is the more attractive of the two. This simplifies the design and cheapens the construction of the eventual pump or motor. Rotating reciprocating balls perform simple harmonic motion and at the same time rotate about an axis parallel to the shaft and perpendicular to the containing cylinder.

Recent work has shown that leakage of oil past a ball in a cylinder exerts a centralising force and is free from hydraulic lock. The authors attempted to show in their paper, at a practical level, that ball plungers can be used in hydrostatic machines where mineral oil is the working medium to give a good industrial life without incurring a prohibitive loss from leakage.

Pitting failure

Design suggestions were made in the paper to avoid failures which have possibly prevented earlier exploitation. Recommended design techniques to avoid pitting failure are that the race diameter/piston diameter ratio should be between 12/1 and 6/1 and the groove radius/piston radius between 1.025/1 and 1.075/1. Some stroking of the piston is lost by using a groove, but since only a narrow track is required, the usable stroke need not be less than 0.365 of the ball diameter.

With standard ball bearings of fully hardened En 31 steel it is suggested that the best material for the sleeve would be flame-plated tungsten-carbide.

Cam-rotor pumps

Cam-rotor pumps and motors, another type which have been developed and are now in production, were discussed in a paper by Mr. C. S. Prendergast, managing director, Deri (Engineers), Ltd. Two designs, each based on the principle that twin-wave displacement of suitable and similar form can combine to provide a resultant straight line flow, are available.

The first incorporates two similar double-lobed cam shaped rotors keyed to a driving shaft and at a circumferentially phased relationship of 90 deg. Each stator has two radial grooves opposed at 180 deg., which carry two slidable vanes. Radial grooves in one stator coincide radially and circumferentially with the other and brushes are linked by rocker arms pivoting on fulcrums in the stationary centre dividing plate.

The second design incorporates a single six-lobed cam shaped rotor. The stator has four equally spaced radial grooves which carry slidable brushes. Motors of this type run in both directions whereas pumps are limited to one direction. The author said that to maintain a straight line output flow it was essential that no appreciable wear took place.

Hydrostatic transmission

Papers submitted to the conference for discussion covered many applications of oil hydraulics in industry and with control systems and components. Hydrostatic power transmissions for vehicles was the subject of a paper by Mr. E. H. Bowers of Stein, Atkinson Vickers Hydraulics, Ltd. Although there are a limited number of vehicles fitted with hydrostatic transmission in production, there are probably well over a hundred prototype vehicles being tested in various countries.

Data in increasing quantities are becoming available to show that the hydrostatic transmissions of today, correctly applied and matched to the vehicle performance, can provide the efficiency, robustness and life that the vehicle manufacturer and user demand.

Letters to the Editor

WHAT IS AN ENGINEER?

Professional status calls for a definition

WHAT exactly, asks Mr. Weyland Smith, is a technologist? May I broaden the question and ask: what (or who) is an engineer? If the engineering profession is to achieve the same status as that of medicine or the law, this needs an authoritative answer. Like Mr. Weyland Smith, I am normally proud to call myself an engineer, but not when the papers say "2,000,000 ENGINEERS DEMAND TEA BREAK."

I know that the Engineers' Guild is working on this difficult and important problem, but I doubt whether they have yet achieved an acceptable and comprehensive definition.

Have your readers any suggestions?

J. K. RICKARD, A.M.I.E.E.

97 Woodlands,
North Harrow,
Middlesex.

THE WAGE PAUSE

THAT there is a difference in meaning between **pause** and **restraint** is unquestionably true in the context of promise and consideration. Government intervention in any phase of wage negotiation has achieved nothing lasting, nor is it ever likely to when hinged to exhortation or slogan of any kind. To have done so initially is to have invited and perpetuated inflation on an ever increasing spiral.

There is in fact no genuine case for wage rises for those engaged solely on piecework but, if anything, a management decision to pay an incentive, hinged to production; and where men are on daywork, to introduce a daywork-piecework system, if practicable.

The strain on the economy of business today is much too difficult to negotiate successfully, unless there be restraint in increasing the hourly rate and reducing the working hours, because the timing is all wrong with the imminence of the Common Market and widespread competition.

FRANCIS B. WILLMOTT,
Forward Works,
River Street,
Birmingham 5.

THE EDITOR

. . welcomes letters on any subject. Post them to Engineering News, Drury House, Russell Street, London, W.C.2.

U.K. DRYERS ARE AHEAD

WHY devote an entire page of your paper to boost an American spray dryer when British manufacturers are at least equal to, and possibly ahead of, the Americans in this field? Further, the application described did not sound particularly revolutionary. Any engineer concerned with drying would certainly consider a spray dryer as an alternative.

E. W. PATES, M.Sc., M.I.Chem.E.

4 Windsor House,
Northolt,
Middlesex.

The policy of Engineering News is to give as wide a coverage of engineering as possible, including news from overseas.—Ed.

"BUT SURELY, SUCH A SMALL KIT CAN BARELY TOUCH UPON VIBRATION CONTROLLED FOUNDATIONS OR CENTRIFUGAL GOVERNORS...?"

Research is not for fast profit

WITH reference to your leading article on engineering research, in the issue of November 30, it is certainly true that a great many commercial directors expect immediate financial gains from their research departments.

Quite apart from the fact that research workers are quite simply not slot machines into which one puts a coin and takes out a profit, it is surely true that many private company research departments exist primarily to provide a publicity front. How can a research worker avoid a deadening sense of frustration with this knowledge, and when he is expected to show quick returns as well? And to what extent can worthwhile fundamental research be carried out in such an environment? So few industrialists really understand the nature and purpose of research.

J. W. ARMSTRONG,
White Lodge,
St. Augustine's Avenue,
South Croydon,
Surrey.

BLOW MOULDED CONTAINERS WITHSTAND HIGH PRESSURE

AS a result of tests carried out on thermoplastic containers, it has been shown that blow moulded containers can withstand internal pressure of the order of 200 lb./sq. in.

Blow moulding, in its simplest form, means that plastic tube is heated and, under air pressure, takes the shape of the mould where it cools into the desired product.

Emerson Walker, Ltd., have announced the completion of a series of characterisation tests with a variety of thermoplastics and using a sample blow moulded seven gallon container as test piece.

The test piece was blow moulded by the firm's test and development department in low density polythene, high density polythene, and polypropylene. The usual weight of these containers is 3 lbs. and this gives a normal wall thickness of about ⅛in. to 3/16in. The test piece design had a variety of curves which were designed to show up abnormal "thinning".

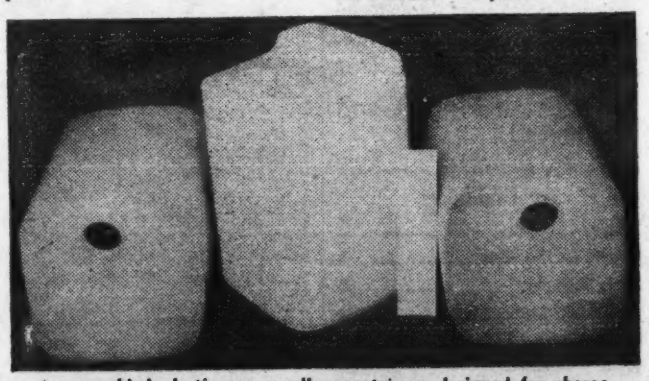
The containers made of high density polythene weighed from approximately 2½ lbs. to approximately 5½ lbs. on a number of different runs, and these weight changes were obtained by altering the die on the extruder. Normal wall thicknesses have been less than 1/16in. to approximately ¼in. for the different weights of containers.

Using low density polythene the test piece has varied in weight from less than 10 ounces to about 3¼ lbs., and the normal wall thickness has varied from 0.017in. to approximately 3/16in. The thin walled specimens were blown for use as liners. The liners were found to be thick on top and on the bottom, and this provides strength where it is needed most.

Amongst the many evaluations which these samples undergo is a hydrostatic bursting experiment; this test is used to determine whether the sample has been blown correctly, that the correct temperatures have been used, and that adequate mould locking force is available to provide good welds at the top and bottom of the test piece.

Standard high density polythene test pieces weighing approximately 5¼ lbs. have a bursting pressure between 160 lb./sq.in. and 200 lb./sq.in. and in every case the first leak or tear has occurred elsewhere than near or on the weld line.

The test pieces were made in natural colours to facilitate inspection for flaws, lesions and other irregularities in the finished blow moulding. This visual inspection is particularly useful with polypropylene test pieces, because the natural polypropylene if mishandled, i.e. with too high an extrusion temperature, or sudden chilling, shows up as a variation in the opacity or translucency of the finished test piece.



Blow moulded plastic seven-gallon containers designed for characterisation tests, having a variety of curves to show up abnormal "thinning". The containers weigh about 3lb. with wall thicknesses of from 1/8in. to 3/16in. The materials are, left to right, low density polythene, high density polythene, and polypropylene.

WORLD'S LONGEST LINE STEPS UP TR4 CAR OUTPUT

ASSEMBLY of the new high-powered Triumph TR4 sports car has now been transferred to the modern £2¼ million Standard-Triumph Vehicle Assembly Hall at Canley, Coventry. A company spokesman said that this is the longest sports car assembly line in the world.

The line is over 200 yards in length, and has stations for 46 units. This latest move is rapidly boosting sports car output towards the target figure of 500 units per week.

It is an all-out effort to fulfil orders received from throughout the world—and notably the $57 million order received from Standard-Triumph Motor Co., Inc., in New York.

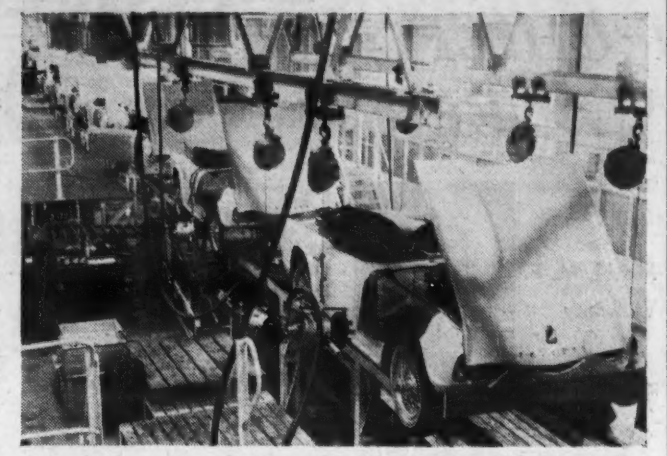
On the "TR4 furlong" the assembly methods employed are similar to those used for the Triumph Herald, with every stage planned to give maximum efficiency and constant emphasis on the highest degree of quality control.

Each unit has a "pitch" or assembly stage of 18ft. giving fitters plenty of space to perform operations under the most favourable working conditions.

At the end of the line each car covers three or four miles of simulated road conditions in a special roller test booth where checks are made on the engine, transmission, brakes (with individual measurements for each wheel), speedometer and steering.

The Vehicle Assembly Hall is built on three levels for handling the large variety of components required for body assembly operations on up to 5,000 vehicles per week. Vehicle bodies are delivered to the top floor, which has a body storage capacity of 500.

Closed circuit television is used as part of an automatic routing system. Television monitor screens in the main control room locate the position of the bodies and visually check their progress at various stages of assembly.



A mid-way station of the new assembly line where the road wheels are put on Triumph TR4 sports cars.

BLAST FURNACES AND THE FUTURE

BLAST furnace engineering, burden preparation and injection processes, and the trend of developments in the future, were the major subjects discussed at the Autumn General Meeting held by the Iron and Steel Institute in London last week.

Controlling factors in the performance of conventional hot blast stove installations were examined in a paper presented by Mr. A. H. Dixon and Mr. B. S. Fowler of Ashmore, Benson, Pease and Co., Ltd. Humidification and oxygen enrichment of the blast will eventually come into common use, together with fuel injection. Therefore, it is necessary to establish the optimum temperature which can be gainfully employed and determine whether stoves in service can approach it. At the same time, such an investigation would assist designers of new plant.

New designs

It was suggested that existing stoves could be adapted to meet temperatures up to 2,000° F. but should the demand prove to be higher new designs may be the only answer.

Mr T. F. Olt, of the Armco Steel Corporation, U.S.A., discussed the growing use of pelletised iron ore as a blast furnace feed. Apart from uniformity in chemical composition and size, the latter permitting stock movement at high driving rates, pellets help to increase production rates and decrease coke and stone consumption.

However, to take full advantage of the higher blowing rates that can be employed with all pellet burdens, present blast-furnaces would need better charging and casting facilities and additional blowing and hot blast capacities.

In his paper on the effect of screened sinter on furnace productivity Mr. N. D. Macdonald of the Workington Iron and Steel Co., Ltd., maintained that today's problem was sinter fines in the all-sinter burden, whereas 25 years ago it was ore fines in the ore burden.

Sinter screen

At Appleby-Frodingham a series of trials had shown the benefits to be gained by using screened sinter burdens. A good sinter screen indicated sinter quality and such practice improved furnace productivity and economy.

The results of these trials will be applied in new plant development to achieve a 30 per cent increase in iron output from existing furnaces.

The author felt that similar experiments on coke sizes could well produce surprises.

Manufacture of hematite irons demands certain considerations to be given to furnace construction and these were detailed by Mr W. E. Osgerby of the Millom Hematite Ore and Iron Co., Ltd. A full carbon hearth is the best practice and only the top quality ceramics should be used in the tuyere area. Velocities must be kept on the high side, and therefore, tuyere sizes must be kept in step with the blast blown.

IRTE sets stricter entry rules

STRICTER rules governing the sponsorship of candidates seeking membership or transfer from one grade of membership to another have been introduced by the Institute of Road Transport Engineers. The object of the revision is to ensure that only those with engineering experience are admitted as members rather than people with merely administrative experience.

As from December 1, candidates from the British Isles who apply for admission or transfer to the grades of Ordinary Membership, Associate Membership, Associateship or Graduateship require the sponsorship of two corporate members of the Institute, of whom one must be either an Ordinary Member or an Associate Member.

Overseas candidates will be required to have their applications sponsored by one Ordinary Member or Associate Member.

The effect of these changes will be felt particularly by overseas candidates.

THIS WEEK IN PARLIAMENT

Sir Keith sees a glimmer of hope for car exports rise

BY OUR OWN CORRESPONDENT

THE serious position over British car exports and the decline in the motor-cycle industry were both spotlighted in Parliament last week.

The one bright spot in an otherwise gloomy picture was that, according to a Government spokesman, the latest car export figures give grounds for "a little hope".

Total exports for the first ten months of this year showed a 37.9 per cent drop, compared with last year. A further breakdown of the figures revealed that in the United States exports were down by 83.5 per cent, in Canada by 53.2 per cent, and in the rest of the Commonwealth by 18.4 per cent.

Sir Keith Joseph, Minister of State, Board of Trade, was asked by Labour MPs what his department was doing to assist the manufacturers to improve on this performance. He said that with the department's help they were making special efforts to recover lost ground. Greatly increased efforts were being mounted in the U.S., he added, when attention was drawn to the scale of the loss in that particular market.

Sir Keith said the fall in exports was of great concern to the Government and the industry, but he believed that the figures for the last few weeks gave grounds for a little hope.

An encouraging note was sounded by a Conservative, Mr. Leonard Cleaver (Yardley), who pointed to the total of £430 million in exports which the industry had achieved in the first nine months of 1961. It should be congratulated, acting, as it was, under very difficult conditions, he asserted.

Motor-cycle recession

There were anxious questions, too, about the recession in the motor-cycle industry. Sir Keith Joseph said there had been a decline in output and exports.

The Government would help in any way it could but the outcome would depend primarily on the industry itself.

Production this year was about 20 per cent down, said Mr. Maurice Edelman (Labour, Coventry, N.). Threatened redundancies and factory closures in the industry called for urgent Government action. Also, what would be the position of the motor-cycle manufacturers if Britain went into the Common Market to face the competition of the Italians, Germans and French?

The Minister replied that world markets were open — subject to tariffs. Therefore, the battle was necessarily bound to be on "merits, prices, salesmanship and service".

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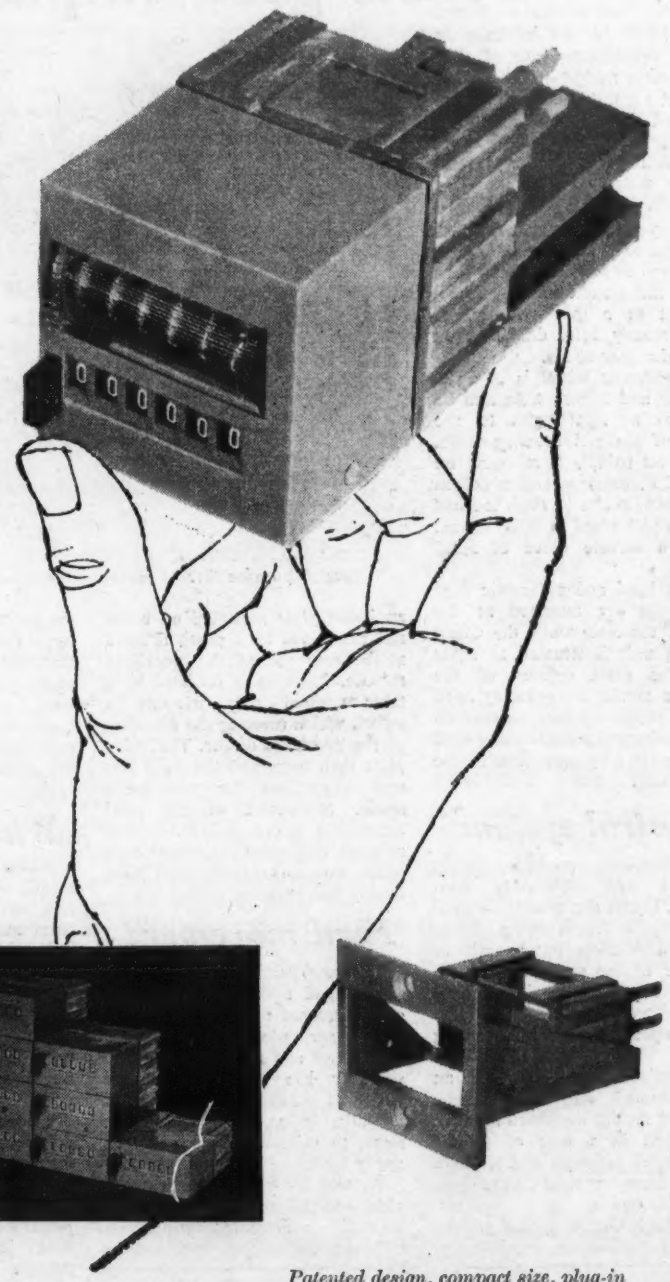

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PERKINS GROUP APPOINT CHIEF DIESEL ENGINEER

TWO major staff changes have been made in the Perkins Group. **Mr. N. M. F. Vulliamy** has been appointed Chief Designer (Diesel) and his former post as manager of the Group Experimental Department has been filled by **Mr. A. M. Porkess.**

Mr. Vulliamy joined Perkins from Cambridge in 1937. He became Chief Experimental Engineer in 1952 and has been manager of the Experimental Department for the past five years.

Mr. Porkess joins Perkins after 18 months as Chief Engineer with the National Gas and Oil Engine Co. Since the war he has also worked on research and development with Ferranti and Ruston and Hornsby.

Mr. N. M. F. Vulliamy

PEOPLE in the NEWS

Mr. F. Kenyon, a senior director of the William Kenyon group of companies, was elected chairman of the Federation of European Petroleum Equipment Manufacturers at its recent Annual General Meeting in Marseilles.

Mr. Kenyon has taken a leading part in the development of the Federation since its inception and its membership now covers the petroleum equipment industry in the United Kingdom, France, Germany, Holland, Belgium, Italy and Austria.

British membership is exercised by the Council of British Manufacturers of petroleum equipment, in whose work Mr. Kenyon has been prominent for many years.

☆

The British Heat Resisting Glass Company have announced that **Mr. A. Newing** has joined the board.

Sir William Garrett has retired after twenty-six years as a director of Monsanto Chemicals.

Sir William, who first joined Monsanto in 1917, was appointed a director in 1935 and he retires from the board at his own request in order to devote more time to his other interests.

He was for thirty-one years a member of the Chemical Industry Joint Council and was chairman of the Association of Chemical and Allied Employers from 1948 to 1950. He was president of the British Employers' Confederation from 1958 to 1960 and is immediate past chairman of the association of British Chemical Manufacturers.

Mr. J. M. Kershaw, who is Monsanto's director of production and joined the company in 1946 as a chemical engineer, has been appointed to the board.

Mr. Kershaw was appointed chief engineer in 1956 and director of production in 1960. He is also a Fellow of the Royal Institute of Chemistry and a member of the Institution of Chemical Engineers.

☆

Bellow Machine Company announce that **Mr. M. L. Bellow** has been appointed an additional director of the company.

☆

Special director and foundry general manager of Firth-Vickers Stainless Steels, **Mr. A. E. Thornton,** is to retire on medical advice at the end of the year. He has been with the firm, and its parent company Thos. Firth and John Brown, for 45 years.

Mr. Thornton was closely associated with the development and manufacture of special steels for the aircraft industry and has been actively engaged for many years in work connected with education and training. He is a member of Sheffield Education Committee and Chairman of the West Riding and North Derbyshire Area Training Committee of the British Iron and Steel Federation.

☆

It has been announced by the National Institute for Research in Nuclear Science that **Dr. J. Howlett** is to become head of their Atlas Computer Laboratory. This appointment is effective from December 1.

Dr. J. Howlett

Dr. Howlett joined the Ministry of Supply in 1940 where he was engaged in mathematical and computational work on a variety of defence problems.

Since 1948, Dr. Howlett has been head of the Computing Group of the Theoretical Physics Division at the Atomic Energy Establishment at Harwell.

☆

Mr. T. L. Birrell has been elected Chairman of the Trustees of the Plastics Industry Education Fund from January 1, 1962, in place of **Mr. C. S. Dingley,** who will, however, continue to serve as a Trustee for the time being.

☆

Mr. D. Ferguson, who joined Dunlop's as an office boy at Fort Dunlop in 1928, has been appointed production manager for tyres at the company's Speke, Liverpool, factory.

After working on the shop floor as an operator and foreman, he was appointed section manager for giant tyres. In 1950 he went out to the Dunlop plant at Sahaganj in India where he was industrial engineer and later general production manager.

On his return to England, Mr. Ferguson was made manager of the compounds department at Fort Dunlop, a position which he held until his move to Speke.

☆

Seddon Diesel Vehicles announce that **Mr. H. Seddon** has been appointed chairman.

Mr. Seddon has retired from the position as joint managing director to ease his business commitments. He was a founder member of the original business established forty-two years ago and will remain a director and a consultant to the company.

Mr. H. Redmond has been appointed deputy chairman and managing director.

☆

Bairds and Scottish Steel announce that **Mr. A. O. Cox** has been appointed to the board and has been made commercial director.

☆

In addition to his duties as manager of the Kirkby factory of the Dubilier Condenser Company, **Mr. J. McCrea** has been appointed a director.

Mr. F. G. Berger has been appointed a director in addition to his duties as production control manager at the company's Acton factory.

☆

The Minister of Power has appointed **Mr. N. F. Marsh** to be deputy chairman of the Electricity Council with effect from January 1 when **Mr. R. S. Edwards** succeeds **Sir Robertson King** as chairman of the council.

Mr. Marsh has been chairman of the East Midlands Electricity Board since May, 1959, having been deputy chairman since 1957.

☆

The Board of Associated Motor Cycles announce that **Mr. J. M. West,** who resigned from the board in August, has joined the Lambretta-Trojan Group and become sales director of Trojan.

Mr. West will be responsible for general sales administration of the group's scooter, three-wheeler, outboard motor, agriculture and industrial engine divisions.

Chief accountant of Brookhirst Igranic, a member firm of the Metal Industries Group, **Mr. R. Cutler,** has taken the additional appointment of company secretary following the resignation of **Mr. Norman Clark.**

Mr. Cutler joined the company in 1957 and was previously chief cost accountant and budget officer with Petters and chief cost and management accountant with Sykes Machine Tools.

☆

Mr. F. Wilkinson, member for marketing of the National Coal Board, has been elected president of the Coal Utilisation Council. He will take office from January 1, 1962.

Mr. Wilkinson, who has spent his entire working life in the coal industry, has been a member of the C.U.C. for the past six years. He was the N.C.B.'s director-general of marketing from 1958 to 1960, when he took up his present appointment.

Mr. F. Wilkinson

Mr. Wilkinson succeeds **Mr. J. S. Turner,** who is retiring after twelve years in office.

Sir John Charrington has been re-elected vice president.

☆

Mr. A. Marshall, production controller of Statter & Co., a member of the Metal Industries Group, has been appointed to the new post of Field Sales Manager.

Mr. Marshall has been with Statter for four years and a large part of his career has been spent in Ceylon, selling and installing electrical distribution gear.

☆

Lord Hailsham, Lord President of the Council and Minister for Science, has appointed **Mr. C. Herzig** of the Ministry of Aviation to be his Private Secretary in succession to **Mr. A. R. Isserlis** who is returning to duty at the Ministry of Housing and Local Government.

☆

Loewy Engineering Company announce that two new directors have been appointed to the board. They are **Mr. E. R. Henschker** and **Mr. R. M. L. Elkan.**

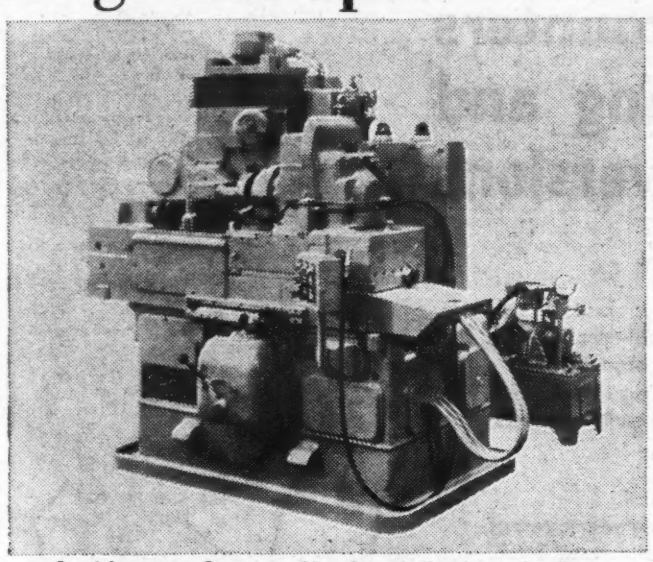
Automatic internal grinder boosts gear output

A NEED for an increase in the production rate of first and reverse mainshaft gears for Bedford truck gearboxes led Vauxhall Motors to call upon the Gear Grinding Co., of Shirley, Birmingham, to design and produce a special purpose, fully automatic internal grinder.

The operation concerned is to grind the tops of alternate mainshaft gears in the bore of the gear cluster, the ground surfaces forming part of a true cylinder, of approximately 2¼in. diameter, on which the gear slides.

The grinding wheel is of 2½in. diameter and 5/16in. wide and its axis lies at right-angles to the length of the reciprocating table. The wheel spindle is mounted on two S.K.F. bearings and is driven by a 1-h.p. motor through toothed belts. Wheel speed is 8,400 r.p.m., giving a surface speed of 5,500 ft./min.

Work head and automatic feed mechanism are mounted at the right of the table while the wheel dressing unit is situated at other end. The main column of the machine carries the grinding head and an automatic feed mechanism for dressing purposes, cutting feed being applied by movement of the work itself.



Special purpose Orcutt machine for grinding internal splines.

Control system

All motions are hydraulically operated and electrically controlled. Hydraulic power is provided by a free-standing Stein-Atkinson Vickers pump unit at the rear of the machine. All the hydraulic valve gear is solenoid operated with the exception of the pilot operated table reversing valve.

Workpieces are held in an air operated diaphragm chuck mounted on the workhead spindle. This runs in a pair of Gamet taper roller bearings, and is chain driven from an S.A.V. vane type hydraulic motor.

Standard Orcutt spline grinder indexing mechanism, consisting of an index plate mounted on cones and restrained by a pawl, is fitted at the rear end of the workhead spindle. Indexing is initiated by a table-mounted dog tripping a switch which reverses the direction of the hydraulic motor. The index plate then turns and the pawl lifts and drops into the next tooth space. Movement of the pawl actuates a micro switch and this reverses the hydraulic motor once again, thus locking the index plate during the grinding cycle.

Feed movement

The workhead is supported on an inclined anti-friction slideway of the crossed roller bearing type, and is spring-loaded towards the right-hand end of the table. The slideway has an inclination of 10:1 and the workhead is moved up this, in a series of 0.005in. steps, to raise the work and thus apply feed.

A total lift of 0.050in. is available, and this can be split up into fourteen or more increments.

Movement of the workhead on the inclined slideway is controlled by a cam on the index plate so that there is a feed increment for each complete revolution of the work, and the feed increment mechanism incorporates a movable peg which actuates a micro switch to initiate the wheel dressing cycle.

Wheel dressing

Wheel dressing is a relatively simple operation for this application as it is only necessary to form the arc of a circle of 1¾in. radius on the circumference of the wheel. It is accomplished with a single pass of the diamond, once in each cycle, and is fully automatic. Compensation for diamond wear is made by means of a micrometer screw in the diamond arm.

To allow for reduction in the diameter of the wheel, when a dressing cycle is initiated the wheel is automatically fed downwards by a hydraulically actuated pawl and this gives alternative feed increments of 0.001in., 0.002in. or 0.003in., plus a zero position for manual operation.

While this machine was developed for a specific purpose, it has provided the Gear Grinding Co. with the opportunity to investigate techniques that should prove equally applicable to automatic spline grinding of a more general nature, and orders have already been received for the production of machines of this type to perform a number of other operations, including the external grinding of involute forms, and the grinding of surfaces curved in two planes.

FLAME PLATING GUN

IT has been pointed out by Union Carbide that our report last week on flame plating of abrasion resistant coatings stated in error that the workpiece seldom exceeds 400 deg. C. This temperature should have been 400 deg. F.

Some readers may be puzzled over the statement that "when the mixture is ignited an explosion occurs". In explanation Union Carbide say that the mixture of oxygen and acetylene is detonated in a controlled manner in a specially designed gun.

This imparts a supersonic velocity to the particles of tungsten carbide or aluminium oxide which are, at the same time, heated to a plastic condition. Apart from the advantages of being able to apply a thin wear-resistant coating the workpiece is not heated to a high enough temperature to cause thermal distortion or metallurgical changes.

Coming EVENTS

THIS WEEK

December 7-8
Symposium on Sintered High Temperature in Oxidisation-Resistant Materials. Church House, Gt. Smith Street, London, S.W.1.

December 8
Symposium on the Degradation of High Polymers. The Moston College of Further Education, Manchester.

December 11-13
British Iron and Steel Federation Accident Prevention Conference, Old Swan Hotel, Harrogate.

December 19
Colloquium on Sheet Metal Testing. Department of Mechanical Engineering, City and Guilds College, London.

January 3-13, 1962
Eighth National Boat Show. Earls Court, London.

January 8-12, 1962
International Heat Transfer Conference, Institution of Mechanical Engineers. Westminster London.

January 9-11
Eighth National Symposium on Reliability and Quality Control. Washington, D.C.

January 15-19
Symposium of Optical Character Recognition. Washington, D.C.

January 15-19
Physical Society Exhibition of Scientific Instruments and Apparatus. Royal Agricultural Hall, Westminster, London.

January 22-25
National Plant Maintenance and Engineering show. Convention Hall, Philadelphia.

January 24-27
Canada Farm and Industrial Equipment Trade Show. Toronto Canada.

January 27-February 2
Electrical Engineering Exposition New York.

February 16-24
International Inventions and Commercial Development Exhibition Central Hall, Westminster London.

February 26-28
Joint I.E.E./R.Ae.S. Conference The importance of electricity in the control of aircraft. London.

March 9-18
Eleventh International Inventors Exhibition. Brussels.

March 13-15
Conference on Testing for Performance. The Plastics Institute London.

March 15
Symposium on the Computer and Mechanical Engineer. Institute of Mechanical Engineers, London.

March 20-24
Eleventh Electrical Engineer Exhibition. Earls Court, London

March 28-29
Third Symposium on Engineering Aspects of Magnetohydrodynamics University of Rochester, New York.

April 10-14
Second International Conference on Stress Analysis. Paris.

April 11
Symposium on Modern Rolling Mill Practice. Sheffield University

April 16-18
Second International Flight test instrumentation Symposium. College of Aeronautics, Cranfield Bucks.

April 21-October 21
World Fair. Seattle, U.S.A.

BRITISH INDUSTRY PREPARES FOR THE COMMON MARKET

The North East argues over three attitudes

ONCE it is assumed that Britain is to enter the Common Market the possibilities open to the management of any particular company are broadly three in number. Two, in the right hands, could be good lines for development; the third almost certainly bad.

I heard all three vigorously argued on the North-East coast. Each of the first two, concentration on raising the standards of the company's traditional products and services and diversification in order to serve wider markets, I found argued by men who also believe that entry into the European Economic Community is necessary if Britain's present level of overseas trade is to be maintained and built up.

Wait-and-see policy

The third view I had not previously encountered. It was that the only possible policy was one of wait-and-see, that it was not possible to tell what would happen, and that the nationalised industries, anyway, would have to place their orders with home manufacturers for social and political reasons.

This disconcerting view, that the publicly owned Boards could be relied upon to dish out a measure of protection thus mitigating the full competitive force of joining EEC, was a reflection of the question I have heard elsewhere — "What would, say, the British Railways do, faced by a choice between equal British and Continental equipment, with similar prices and faster delivery from the Common Market competitor?" The answer could be an uncomfortable one.

It does not follow that a Government which did not stop the Electricity Council from giving a generous wage increase in the middle of the Pay Pause could be expected to order, if it was able to, that nationalised industries should place orders with companies who had fallen behind the European competition

Export achievements

More optimistic views of the future, based on successful competition in Europe and in world markets against Continental competitors, were held in most of the works I visited.

Newcastle and the great industrial belt stretching along the coast north and south of the Tyne has known many famous names, Charles Parsons, Claud Gibb, George Stephenson, and no less celebrated is the name of Armstrong Whitworth.

At the Close Works of Armstrong Whitworth (Metal Industries) Ltd., in Gateshead, I learned of promising technical developments and of steady achievement in export sales.

Exporting some 30 per cent of their total production, Armstrong Whitworth (Metal Industries) send their iron, steel and alloy heat treated rollers to almost every industrial market in the world for use in the rolling mills of the steel industry, in rubber and other manufacturing processes. There is a range of rollers here from infants of 14 lb. up to giants of 40 tons.

Mr. R. H. Philip, the company's Sales Director, explained that export contracts had been carried out for West Germany and the Soviet Union. The major countries of the Commonwealth figure, of course, on the list.

Sharp competition now comes from Italy and Japan, although Armstrong Whitworth rolls are exported into Italy. In this, the primary field of its activities, the company is able to report a full order book.

One side of the company's production which is feeling the effects of the much reduced demand for oil drilling equipment is manufacture of pumps, rotary tables and tool joints, lever lift masts, travelling blocks and so on. The only effect future expansion of the Common Market might have here is in its strength in generating an even swifter economic growth in Europe, and with it enlarged demands for oil and petroleum products.

Road machines needed

Of the Common Market prospect, Mr. Philip told me:

"We are not unduly worried. We are already competing with our industrial counterparts in the Continental countries."

As a personal opinion, Mr. Philip thought that certain products would find themselves meeting very strong competition, from countries with a series of advantages.

Whether in Western European states, with their highly advanced road systems and strong financial resources for building more, or in the developing regions of the world with their urgent need for better communications, there is plainly a big future in manufacturing road making equipment.

At the Close Works I heard of the multi-wheel, pneumatic tyred compactors made under licence from a French company. The Armstrong Whitworth Albaret 22-ton self-propelled Isopactor, for example has five leading pneumatic tyred rollers, which do a much more accurate job of compaction of the rolled material forming the base for roads or runways.

Best course clear

A few minutes drive away, over the low level swing bridge across the Tyne, is the Exchange, where the Coals-from-Newcastle were bought and sold and the output of the Northumberland Coalfield was exported to worldwide markets.

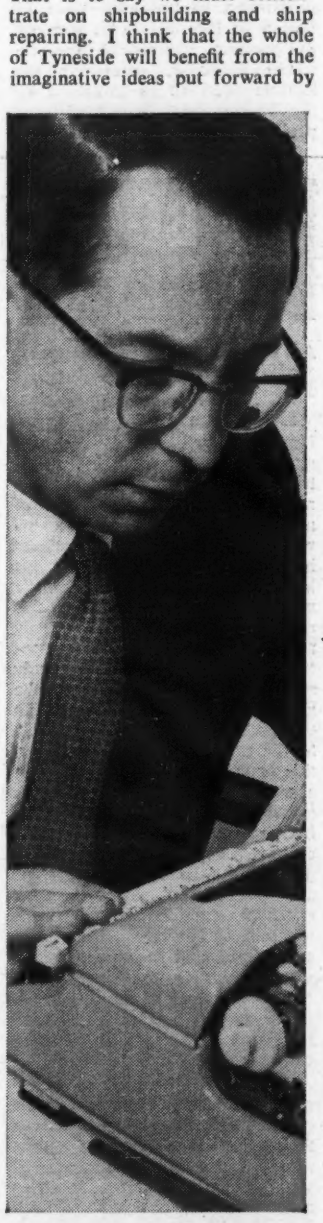
The great hall of the one-time Coal Exchange I found deserted, but beyond it lay the office of Mr. P. R. Errington, secretary of the Tyneside Chamber of Commerce, whose view of what the best course for Tyneside industry should be was both clear and determined.

Mr. Errington is strongly aware of the traditional strength of Tyneside engineering — in shipbuilding, ship repair work, and in heavy industrial manufacturing. It is on this he would like to see the Tyneside area building its future.

Imaginative ideas

On the effect of the industries in the North East of Britain aligning herself with the Rome Treaty, Mr. Errington declared, "I am not at all pessimistic. I do not believe we have to diversify and lose our special characteristics.

"We must specialise and do even better the things we do best. That is to say we must concentrate on shipbuilding and ship repairing. I think that the whole of Tyneside will benefit from the imaginative ideas put forward by



Engineering News Industrial Editor, J. D. F. Perry, continues his Round-Britain series on the Common Market.

Vickers and Swan, Hunter for the Q3.

"The proposals they put forward were for a liner of the 1980s, not for something which would be out of date by the time it was put in the water. Remember that Vickers Armstrongs and the Swan, Hunter Wigham Richardson people have put millions into modernisation and are competitive with any yards in the world."

Labour relations in the region, in Mr. Errington's view, are good and productivity has been raised to high levels.

I discovered conflicting views on the labour situation. One executive was sure that the much more common practice on the Continent of having only one union in one works made for greater flexibility. A man could be asked to do a number of jobs for which he had the ability, provided his earnings did not drop, with obvious advantage in productivity.

But in at least one works I was told that something very like this was going on, the possibility of troubles arising from this quite unofficial and unrecognised practice being extinguished by the high level of earnings and particularly direct contact between higher management and the shop floor.

The suggestion was also made that greater flexibility of labour existed in the new lighter industries and certainly I saw at one works three automatic machines being operated by one woman. It was claimed that in heavy engineering shops each machine would be tended by a male operator.

Medium size works

The Tyneside area including, in addition to its traditional marine and heavy engineering interests such sophisticated products as the ceramic dielectrics and the zirconium compounds of Associated Lead, the protective and decorative paints of British Paints and of International Paints, and a great many others, contains on the trading estates and in the heart of Newcastle some medium sized works carrying out engineering work at a standard which means the Common Market should bring them nothing but opportunities.

One of these is British Engines, who are precision engineers making components for a wide range of famous companies, non-ferrous founders working to unusual degrees of accuracy, and who also do motor and fuel injection work.

With an unusual range of the best of British machine tools, British Engines were able to show me in a quick tour of their factory European equipment which they believe themselves to be, so far, the only British company to have imported.

The accuracy and complexity of work carried on here for nuclear plant, for chemical installations and for the aero-engine firms, plus the excellent transport facilities at the door suggest a future of rapid progress in an enlarged European trading area.

Turbo-generators

No less well known than Vickers themselves, C. A. Parsons have on their order book at the moment some of the largest turbo-generators in the world, for service in Britain or abroad. In the long list of exports from Parsons' Heaton Works those to the Commonwealth, the United States and South Africa, form the major part.

Six of these machines will have outputs of 500 MWs and over. One of the 500 MW units now being erected at the Tennessee Valley Authority's Colbert Steam Plant in the United States is the largest ever to be exported from any country. It is a cross-compound machine, each line running at 3,600 r.p.m. and driving a 250 MW hydrogen/liquid cooled generator.

The operating conditions of the turbine are 2,400 lb./sq. in pressure, 1050 deg. F. temperature, with re-heating to 1,000°F.

In Canada the first of two 300 MW machines for Lakeview Power Station is now in operation and is the largest yet in service in the Commonwealth including the United Kingdom.

Other machines commissioned overseas this year include 30 MW sets at Bunbury and Bulimba Power Stations in Australia; a second 30 MW set in the Ijora B Station, Nigeria; and a fourth 30 MW set at Swartkops Station, Port Elizabeth, South Africa.

Nuclear power

In the nuclear field good progress has been made on the erection of plant supplied by Parsons to Italy's first nuclear power station at Latina just south of Rome. This plant includes these three main turbo-generators each with an output of 70 MW.

As well as building turbo-generators Parsons also manufacture all types of power and distribution transformers. Orders for these are at present in hand for export to America, Eire, the Middle East and South Africa.

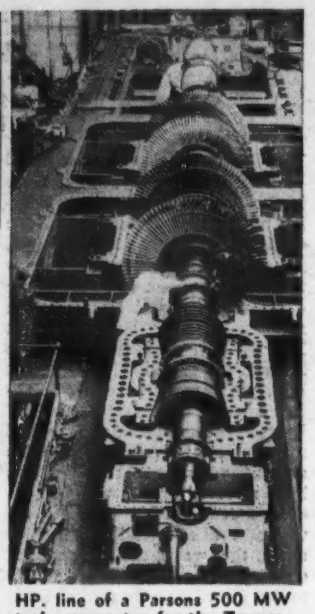
One of the most dynamic figures of the North-East industrial scene just now is Mr. R. H. Mann, chairman of Victor Products, of Wallsend-on-Tyne, mining engineers and makers of flameproof equipment.

Reg Mann began the steps which should mean his company prospering in the all-out competition of the European Economic Community some years ago.

"When the coal mines were nationalised," he told me, "as suppliers of mining drills and flame proof equipment we became virtually dependent on one customer. This seemed to me much too risky: history since then has shown just how risky."

So the decision was taken to aim for a programme of one-third production for the British mines, one-third for mines overseas and one-third general non-mining products. The last third has led to flame proof equipment for refineries and sugar installations and to a series of problems over differing specifications and safety standards.

In all this, whether meeting the high standards laid down by the NCB or getting out a new electric hammer drill that passes the stiff European requirements a consistent aim has been for better productivity. Mr. Mann is also chairman of the Tyneside Productivity Association, and a pioneer of using a computer to control the working of his factory.



HP. line of a Parsons 500 MW turbo-generator for the Tennessee Valley Authority, U.S.A., under erection at Heaton Works.

In a manufacturing company which has successfully diversified and won a reputation for the way in which it is run, what is expected of the Common Market? The answer is first that Reg Mann is convinced that the growing protection of new industries in the Commonwealth means that for survival we have to look to other outlets. The United States has shown agility in protecting home industries threatened by successful imports.

The USSR is a possibility but there are political factors not to be left out. This leaves only one answer—Western Europe, with the swiftest rising industrial output, the fastest growth in demand, and serious tariff barriers against us if we stay outside.

Victor Products is not just pleased that negotiations are going on. It is finding out the best way to benefit.

"Through a firm of merchant bankers," Mr. Mann told me, "we are scouring Europe looking for chances to buy our materials cheaper than we can in the UK. Let me give you one example.

In one industrial light fitting we find that a Dutch competitor pays less for his components than we do to this extent:

Glass fittings 27 per cent less.
Nuts and bolts 14 per cent less.
Rubber gaskets 22 per cent less.

This is not an isolated example. Once Common Market membership gives manufacturers the opportunity and the necessity to react to this sort of position one of two things will happen. Either the parts will be imported or the price will fall.

It is from developments such as these that new success for British exports in markets additional to Europe may well spring.

NEXT WEEK: Glasgow

This A.W./Albaret Autopactor pneumatic-tyred soil compactor, is made by Armstrong Whitworth (Metal Industries).

WELDED JOINTS WITH CLAD METALS

WHEN articles are fabricated from cladded metals, there is sometimes difficulty in preserving a continuous covering of the cladding metal—at welded joints, for example. This is particularly the case where the cladding is one of the rarer metals and, for cost reasons, is very thin. **Patent No. 881,381,** granted to **William Edward Ballard** and **Metallisation Ltd.**, provides a means for applying a cladding metal at welded joints between members of cladded metal; the method can also be applied where the cladding has been removed or damaged locally.

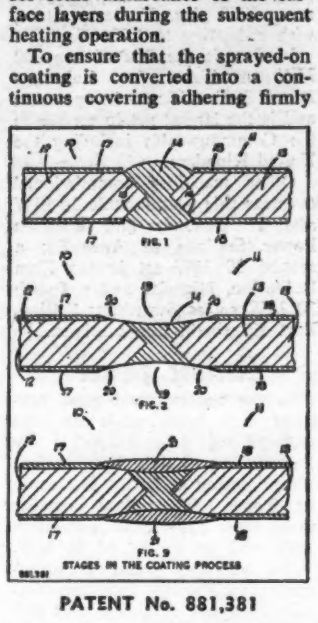
In the case of a welded joint where a filler metal is used to effect the weld, the base metal cores 12, 13 of the two metals to be joined are shaped to form V-grooves to receive the filler metal 14 in accordance with conventional welding techniques. The quantity of filler metal deposited is preferably sufficient to project proud of the outer faces of the coatings 17 and 18 of cladding metal.

After welding, the filler metal 14 is lightly ground down or machined to form shallow depressions 19 flush with, or just below, the interfaces between the existing claddings 17, 18 and the respective core members 12, 13. Bevelled face portions 20 are provided at the edges of the claddings 17, 18 so as to provide a fairly extensive area of contact between the existing cladding metal and the coating to be applied over the filler metal 14.

If necessary, the surface of the filler metal may be further roughened before applying the cladding by spraying. The spraying operation may be carried out in any known manner, for instance, by metal-spraying pistol. During spraying, the metal being sprayed may be protected from oxidation by surrounding the spray jet with an inert gas shield such as argon.

The depth of the sprayed-on coatings 21 may be such that their outer faces stand slightly proud of the existing cladding. This allows for some disturbance of the surface layers during the subsequent heating operation.

To ensure that the sprayed-on coating is converted into a continuous covering adhering firmly



PATENT No. 881,381

to but not becoming alloyed with the filler metal and any exposed portions of base metal, carefully controlled heating is then applied. Preferably, heating is effected by establishing an electric arc, shielded with an inert gas such as argon, between an electrode and the sprayed-on coating.

If desired, the coatings 21 may then be ground or machined so that their outer faces are flush with those of the existing claddings 17, 18.

The method may be applied to any combination of base metal and cladding metal, and is of special advantage for titanium claddings.

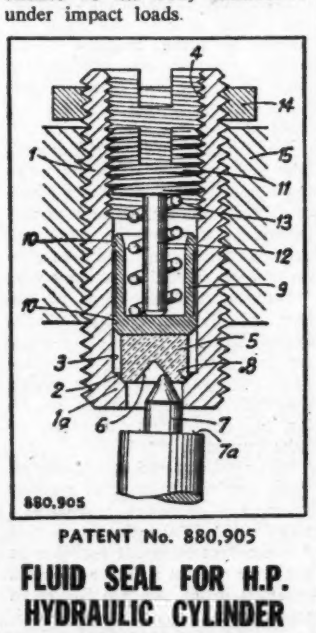
SHOCK-ABSORBING PIVOT BEARING

SPRING - LOADED shock-absorbing pivot bearings for instruments, etc., have usually presented some difficulties in adjustment, owing to a lack of "feel" in the mechanism. **Patent No. 880,905** taken out by **Seltz & Co.** of Switzerland is designed to overcome this disadvantage.

The bearing covered by the Patent has an externally threaded body member 1 formed with a conical seating 2 on which seats a bearing element 5 of synthetic carborundum. The bearing element 5 is held coaxial relative to the body member 1 by means of a sleeve 9 which engages the inner wall along two bearing surfaces 10. The upper part 4 of the inner wall of body member 1 is tapped; this engages with the head part 11 of a locking member. Integral with the head part is a rod 12. A coil spring 13 bearing against the head part 11 urges the sleeve 9 downwards so as to hold the bearing element 5 in position.

To adjust the axial play of the moving element pivoting in the bearing, the locking member (11, 12) is screwed down until its rod 12 bears on the bottom of the sleeve 9, preventing axial movement both of the sleeve and the jewel 5. The locknut 14 is then unscrewed so that the body member 1 may be screwed further into the frame 15, until one notices that the movable element pivoting in the bearing has no more axial play. The movable element can now be given the desired axial play by unscrewing the body member 1 through a predetermined angle. The locknut 14 is screwed down again and the locking member (11, 12) unscrewed.

The patent also covers pierced jewel and cylindrical pivot arrangements, and means for preventing the cylindrical face of the conical pivot, as illustrated, from coming into contact with a metal surface of the body member 1 under impact loads.



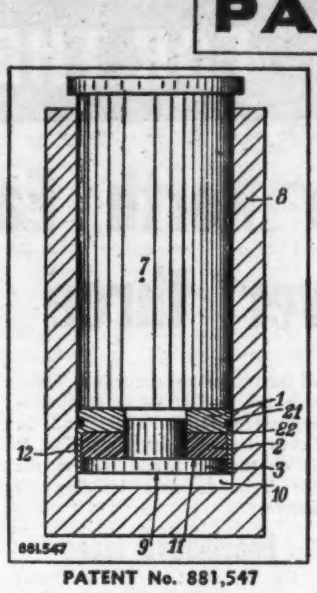
PATENT No. 880,905

FLUID SEAL FOR H.P. HYDRAULIC CYLINDER

AN efficient fluid sealing joint for hydraulic cylinder and piston assemblies working at high pressure, of comparatively simple construction, is proposed in **Patent No. 881,547** by **Societe des Grands Travaux de Marseilles** and **Rene Beghi** of France. The seal comprises essentially a cup, fixed to the front face of the piston, with a thin flexible wall which is pressed against the inner wall of the cylinder by a resilient block in compression; the resilient block being compressed by an auxiliary piston subject to fluid pressure.

Several versions of the invention are described in the Patent, including the arrangement illustrated here, which shows, attached to the main piston 7, a cup 1 with a flexible skirt 12. The large

new PATENTS



PATENT No. 881,547

face 9 of a differential piston 3 receives the thrust of the fluid contained in the space 10, and transmits it to a resilient block 2 located between the annular face 11 of the piston 3 and the cup 1.

The pressure acting on the annular face 11 is increased in proportion to the area ratio of face 9 to face 11. This increase in pressure compresses the resilient block 2, deforming the flexible skirt 12 as indicated by the broken line, thus forming a perfect seal between the piston 7 and the cylinder 8. The higher the pressure in the chamber 10, the tighter the seal.

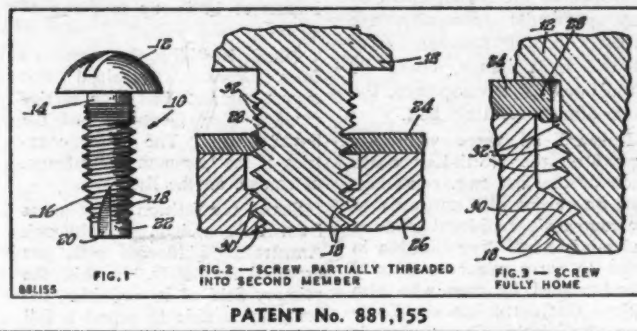
To avoid leakage when the fluid is not under pressure, a sealing ring 21 in a groove 22 of cup 1 may be used.

CAPTIVE THREADED FASTENERS

TO avoid the nuisance arising from dropping or losing a screw when dismantling or assembling components, the **Illinois Tool Works, U.S.A.**, proposes in **Patent No. 881,155** a screw that can be permanently secured in the bore of one of the workpieces in such a way that it can be freely rotated in the bore to permit assembly to, or removal from, another workpiece.

Referring to the illustration, the shank 16 of the screw 10 has a cylindrical portion 14 and a thread 18. The latter decreases in depth towards the end of the shank remote from the head to facilitate entry into a workpiece. A recess 20 is formed in the shank to provide a thread cutting edge 22. Between the thread 18 and the cylindrical portion 14 of the shank there are annular projections 32 of diameter less than the outer diameter and greater than the root diameter of thread 18.

During assembly, the screw 10 is screwed through a bore in the workpiece 24 into the member 26. (A thread may be formed in the bore of the workpiece 24 and member 26 before assembly, or it may be cut by the screw.) During the final stage of movement, the annular projections 32 on the screw deform the thread 28 in the bore of the workpiece, thus preventing the screw from being screwed off the workpiece. The cylindrical part 14 of the shank, however, can rotate freely in the bore. Moreover, when the screw is moved so that the end of the thread 18 engages the workpiece, the annular projections 32 hold the screw concentric with the bore.



PATENT No. 881,155

BOOK REVIEWS

An Introduction to the Properties of Engineering Materials.
K. J. Pascoe, Blackie & Son, Ltd., Glasgow. 295 pp. 35s.

However brilliant a designer may be, the success of his undertaking will in many instances be reflected by his correct choice of materials, and with such a bewildering variety of materials at his disposal, it is important for him to know more than just their mechanical properties. For this reason it is becoming increasingly necessary to teach the fundamentals of metallurgy, and to study solid state physics as part of the general training for engineers To this end, as well as being a guide to the more experienced designer, this book will be invaluable. For a modest price, a wealth of basic information is available and has been so arranged that a minimum of time is needed to pin-point any particular aspect. The publishers are to be congratulated on their excellent production, and the author also for the excellent diagrams, which in so many publications appear to be thrown in at the last moment in order to clarify some particular point. In this book they are inherently part of the text.

The book starts with an explanation of the atomic structure of materials and then discusses their behaviour first as a gas, then as a liquid, and finally in a solid state. Crystal growth is then covered, following chapters dealing with binary alloys and with equilibrium diagrams. The latter part of this book then deals with strengthening of metals and mechanical testing, followed by the relationship of mechanical tests to the design of engineering structures. This chapter should help the younger designer to gain confidence while trying to apply his theoretical knowledge to a practical problem. Heat treatment of steels, alloy steels, corrosion and welding are valuable chapters concluding the book. The final chapter briefly touches on nuclear physics and may be considered by many as out of keeping with the rest of the book.

R. D. CULLUM.

Electrical Engineering Materials.
A. J. Dekker. Prentice-Hall International, Inc., London. 208 pp. 42s.

This book was first published in the United States in 1959, and the same edition is now being published in Great Britain with a consequent reduction in price of 12 shillings.

On its first appearance, the reviewer felt that the book would fulfil ideally the need for a text at university level explaining the physical processes responsible for the more common electrical and magnetic properties of materials in a manner neither too naïve, nor yet too specialised. It provides a basis around which to design a lecture course on the electrical properties of materials suitable for second and third year undergraduates in electrical engineering, and can be strongly recommended to university teachers. It could also be read with pleasure and reward by many electrical engineers whose undergraduate days have long since passed.

The book may be divided roughly into three parts, dielectric behaviour in both static and alternating fields, magnetic phenomena, and conduction in metals and semiconductors including junction effects. The treatment is wholly classical, reference being made to quantum effects only when absolutely necessary. Within this classical framework explanations are thorough and in many cases novel treatments are given.

In choice of material, layout, and illustration the book is excellent. There are few printing errors, and each chapter contains a set of problems and answers.

P. N. ROBSON.

Communications & Electronics Buyers' Guide, 1961-2 edition. Editor, C. C. Gee, Assistant Editor, D. W. Dwyer. Heywood & Co., Ltd., London. 244 pp. 63s.

This comprehensive guide to the electronics industry is in four main sections. The Products Section gives a classified index of products and a trade name index. The Manufacturers' Section contains a manufacturers' index, index to U.K. distributors and agents, and the geographical distribution of manufacturers. The third section deals with government departments and establishments, and professional, trad and research organisations. Sec tion four is a comprehensive in dex to products, in French, Ger man, Spanish, and Russian. Thi book should surely be in the pos session of everyone concerne with the communications indus tries.

Modern Civil Engineering Prac tice. Advisory Editor, R. Ham mond. George Newnes, Ltd. London. 493 pp. 80s.

A well-illustrated general revie of modern civil engineering prac tice. It gives a good overa picture of the recent achievement of the civil engineer as well a an introduction to the subjec The whole field of civil enginee ing is covered on a world-wid basis. The book would be of pa ticular use to a young man think ing of a career as a civil enginee in spite of the rather high price A wealth of information is con tained in the book, which coul be read with profit by everyon concerned with the subject. Th illustrations are particularly we chosen, and the production i excellent

Aids to Machine-Shop Practice C. T. Bower. Odhams Press Ltd London. 192 pp. 18s.

"Why didn't I think of that be fore?" could well be the remar of many engineers looking at th unique collection of over 200 in genious and practical hints selecte from Machine Shop Magazine This book is designed to help th production and maintenance en gineer, machine operato draughtsman and others with a interest in the machine shop.

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This useful book should b kept in a handy place whereve machining operations are carrie out. It forms a companio volume to Aids to Worksho Practice, by the same author.

In a Metal Merchant's Office Edited by L. H. Tarring an H. G. Cordero. Quin Press Ltd., London, 355 pp. 30s.

This is the second edition of thi useful guide to trading in metals ores, iron and steel, and scrap A great deal of interesting in formation is given on the engi neer's raw materials.

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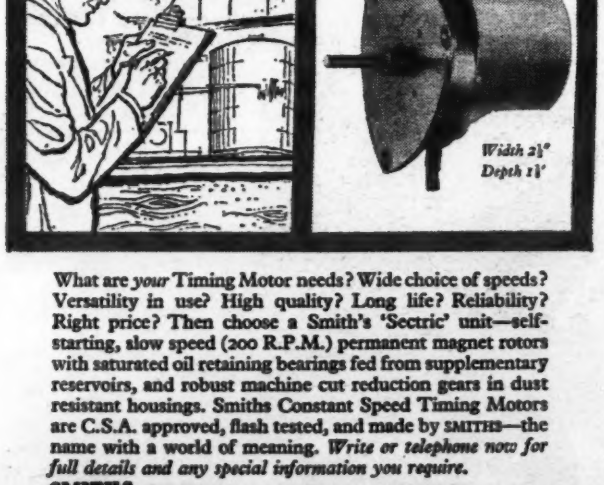

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EDUCATION and TRAINING

SMALLER FIRMS JOIN FORCES FOR TRAINING

by OUR EDUCATION CORRESPONDENT

DEVISING comprehensive training schemes in small and specialised firms can be a severe problem for managements. Although the individual firm would be able to offer a thorough training in its own field, this degree of specialisation is not what a boy leaving school requires; he wants an overall view of the industry to give him a basic understanding and a knowledge of all the types of job available.

Here the larger firms have the advantage, since they have a wide range of processes enabling them to give a comprehensive training programme within their own factories.

To overcome this difficulty several organisations have been established in the United Kingdom to control the training schemes of a number of small firms, and perhaps the largest of these is the Engineering Industries Association Group Apprenticeship Scheme (EIGA).

Terence Challoner inspecting the work of his fellow - apprentice operating the capstan, Tony Day. Both are training under the Gloucester Group Scheme

Group training on these lines was first proposed by the London committee of the Engineering Industries Association in 1953, and Industrial Administration Ltd. was asked to investigate the possibility of collecting together a group of firms to form a collective training scheme.

In 1954 a pilot scheme was operated in West London with such success that EIGA has since expanded rapidly, and there are now 363 member firms formed into 22 groups controlling 700 apprentices.

Organisation

In the past smaller firms have tended to give a rather haphazard form of training with no real objective or planning behind it. A trainee would be put into a department and left there, often much longer than necessary, until such time that the works manager remembered to move him. This is no way to get the best out of a boy, and with the EIGA system the responsibility and organisation of training is transferred from the firms, while within each group of members a variety of experience may be obtained without the need for additional capital expenditure.

Registration in a group is open to any firm employing engineers and is not confined to the members of the Engineering Industries Association. A registration fee of £5 is paid by each firm, and £3 10s. per month for each apprentice from the date of enrolment as a probationer.

The groups within EIGA are determined geographically and the policy for each group is governed be co-opted to serve on the local by a committee of senior executives from participating firms. Representatives from the youth employment services and the local educational organisations are also invited to attend committee meetings and to advise on matters in their related fields. Routine administration is delegated to the Group Engineer who is responsible for the co-ordination and supervision of training.

When a group is formed early steps are taken to inform the secretary of the Engineering and Allied Employers District Association and this is followed by a request for a named employer to Training Committee.

I recently visited Mr. A. J. Bowring, Regional Engineer and Secretary of the Gloucester group. This group was started two years ago at the request of the Gloucester Industrial Education Association and there now are 24 member firms. At the moment there are 51 apprentices and 14 vacancies showing that only boys who can be proved thoroughly suitable are taken on, and places are not just filled for the sake of it.

Since the group began the county of Hereford has joined in, and on November 22 Worcester will officially be made a member.

One of the principles of EIGA is to maintain a very close and personal contact with both the firms and the boys themselves, and this feeling is generated from the initial interview onwards.

In the early days of establishing a new group in the area, the Regional Engineer has a tough task ahead of him making the EIGA system known and appreciated by school careers masters and local industry.

Interviews

The larger firms in the area will probably all have their own apprentice schemes which have become established and well known and this enables them to pick from the best of the applicants in that area, since in the past the smaller firms will have been able to offer no apprenticeship that could compete with their larger brethren.

In the early summer the member firms of the group give the Regional Engineer the quota of apprentices that they wish to have during the following year. Initially the Regional Engineer interviews all applicants and those that are considered suitable are passed on to the individual member firms to interview.

The Regional Engineer will also visit the parents of the boys, since EIGA considers that a personal knowledge of the environment of a boy goes a long way in predicting the sort of trainee he will turn out to be.

The parents are advised on what is expected of the boy, and are asked to encourage him and take a lively interest in his training period. This form of visiting means a lot of hard work for the Regional Engineer, usually late at night, but it has paid many valuable dividends.

He will also visit the factory at which the applicants will train, and will meet all those who will have some part in the boys' training, from the works manager to charge hands.

There are four types of apprenticeship provided in EIGA; craft, technician, student engineer and graduate. Mr. Bowring said that "In the Gloucester group, the small firms' greatest need is for craftsmen, and the graduate is usually more interested in research and development and so goes to the larger firms".

Thus up till now the main aim has been to train craftsmen in this particular group, and the boys are taken from the "A" stream in the Secondary Modern School, or the Grammar School.

Basic training

Each boy will spend the first two years with his sponsor firm on basic training and then if suitable he may be transferred to another member of the group. This interchange leads to a broadening of outlook and also cures "wanderlust" at an early age. Some of the larger firms in the area also join EIGA to take advantage of the transfer scheme.

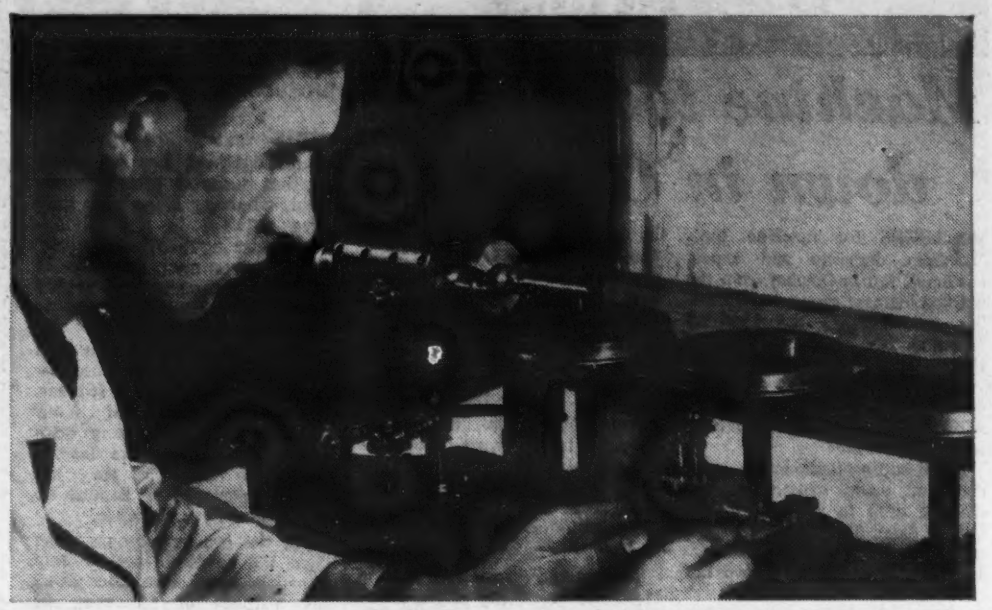
If a sponsor firm feels unable to give an adequate preliminary training the boy may be sent to one of the Government Training Centres which give a one-year course in basic engineering.

During the basic period the student is encouraged to make some piece of engineering equipment of his own interest. For example one boy has visited the Gloucester locomotive sheds and made his own drawings of a 2-8-0 locomotive using a 4½in. gauge, and designed to pull 1½ tons. The complete manufacture will be his own, including the castings and forgings; this ensures that the boy has a good understanding of the many production processes involved.

Often the boys have their own projects, buy the necessary materials from the firm and do the work in the evenings.

It is compulsory for a boy to attend a Technical College one day and one evening a week. Since the majority of the apprentices will be on craft courses they will be taking the City and Guild examinations.

The training syllabus for the 45 to 50 crafts that may be studied in the EIGA system are drawn up by the Central Technical Advisory Committee in London. The committee includes members of the main engineering institutions and executives of the City and Guild Board.



Apprentice R. Sheppard assembling a lubricating box on the model locomotive which he is building from his own drawings.

Awards

Once the enthusiasm of a small firm has been roused towards training, the boy will often receive far more than would be obtained with a larger firm. For example one firm that was visited, Walker Crossweller and Co. Ltd., said that two of their apprentices are finding some of the technical college work difficult to grasp, mathematics being a common stumbling block, so they have arranged special tutorial periods in works time.

Mr. Bowring told me "Out of 500 apprentices only five had left their parent firms two years after ending the course".

At the end of the five years' indentured apprenticeship a special certificate of merit is awarded by EIGA to about 45 per cent of the apprentices who have reached a high standard.

Apprentice supervisors' course

A FIVE-DAY residential course for apprentice supervisors and training officers organised by the British Association for Commercial and Industrial Education has been held at Avoncroft College, Bromsgrove, Worcestershire, this week.

Similar courses have been arranged by BACIE in the past and there are three scheduled for next year which will be held at various centres.

While the majority of course members have been newly appointed apprentice supervisors and assistants, it has also been found of value by more experienced instructors.

Ministry speakers

Representatives from government departments and the services have attended the courses as well as those from the engineering and allied industries and there is generally a wide range of age, education and experience to be found among the course members.

Speakers are invited from the Ministries of Education and Labour, the City and Guilds Institute, from the universities and from industry, and each session consists of a lecture followed by a discussion period.

Among the subjects to be studied are psychological testing and methods of recruitment and selection, secondary education and the further education system, and the organisation of apprentice training.

Course fee is 25 guineas to members of BACIE and 30 guineas to non-members.

D.S.I.R. grants to be reviewed

CONSIDERATION of D.S.I.R. grants will now be included in the terms of reference of the Standing Advisory Committee on Grants to Students as the result of consultations between the Ministry of Education, the Scottish Education Department and the Department of Scientific and Industrial Research.

The committee was set up last May under the chairmanship of Sir Francis Hill to advise the Minister of Education and the Secretary of State for Scotland on questions arising from the system of awards to students from public funds. The need for such a committee was set forth in the report of the Anderson Committee on Grants for Students.

It has now been agreed with the Minister of Science that its terms of reference shall be extended to include consideration of D.S.I.R. post-graduate grants, so that in future the committee will be able to advise all three Ministers about both undergraduate and post-graduate awards within the fields of the three Departments.

First task of the committee will be to review the standard rates of grants for students at universities, for students following courses of degree or comparable standard at further education institutions, and for students at training colleges.

The subject of increased grants for students has been the subject of a great deal of speculation recently and it is hoped that the committee will make its recommendations to Ministers early in the New Year.

To assist the work of the committee, three members of the D.S.I.R. Post-graduates Training Awards Committee have been nominated to serve on it.

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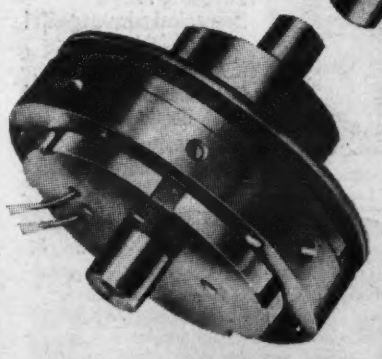

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Machine tool orders down in October

ORDERS for machine tools from domestic and export customers fell in October from the marked increase shown in September according to the National Machine Tool Builders Association.

Net new orders for all types of machine tools were $56,950,000, a drop from $66,600,000 in September.

Metal cutting tools, lathes, grinders and drills, experienced the sharpest drop in domestic orders falling from $34,050,000 in September to $29,550,000 in October. This is still $4,000,000 above the October 1960 level.

*

Export orders for metal cutting tools in October total $18,950,000, 35 per cent of the month's total volume. During September this portion of the orders accounted for 38 per cent of the total business.

At present approximately one-third of the U.S. machine tool production is destined for export. The European nations, which to a large extent were not affected by the American recession, are the biggest customers due to a continuing programme of industrialisation.

Export orders for metal cutting equipment during the first 10 months of 1961 total $156,400,000, or 31.2 per cent above a like period of 1960.

Metal forming equipment purchases during the first 10 months of 1961 totalled $104,550,000, approximately 18 per cent below the 1960 pace.

*

Orders for cutting tools rose in October to $46,050,000 from $41,200,000 in September and $40,650,000 in October, 1960. The 10 month total of $402,850,000 was down 4.5 per cent from 1960.

Forming tool orders in October were up to $1,800,000 from $1,700,000 in September, with a 10 month total of $124,450,000, an increase of 3.8 per cent from a like period in 1960.

The machine tool industry, like the automotive industry, is a very good barometer of business. The automotive activity is considered by many business men to be a good short term indicator, while the machine tool industry is the best long term indication of production activity.

An increase in machine tool orders clearly indicated an impending increase in manufacturing and production activities. Being the basic requirement essential to all types of manufacturing in a broad range of industries it is less subject to fluctuations within a vertical segment of any single specialised field.

One of the strong contributing factors to popularity of American machine tools appear to be the ability to perform a number of operations in succession.

The multi-purpose automatic screw machine has remained a "workhorse" to industry. The ability to transform automatically fed stock into a finished part, through a series of automatic operations without removal from machine or manual transferance, has many advantages when compared to the use of simple machines requiring manual transfer of material.

*

The multi-purpose machine concept has been adapted to a number of American machine tools. The turret lathe, where a successive series of cuts turns out a single object is yielding to the multiple spindle machine which achieves the same result by a programmed process. It appears that more design effort has been devoted to developments of this nature in the U.S. than in Europe, perhaps because of the labour costs differential.

The foremost advancement in American machine practice is without question the multi station transfer machine — which is really a series of individual units integrated into a single machine to eliminate material handling of machined products.

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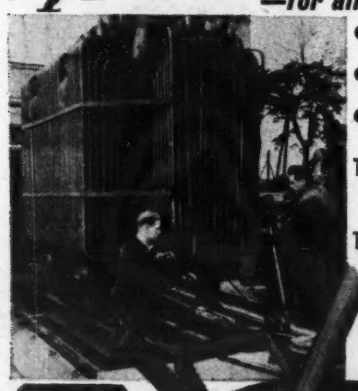

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Most British companies could increase profits by 10 per cent if they applied materials management

IF an appropriate programme of materials management was applied by British manufacturing companies, more than half could increase their profits by at least ten per cent. Managing directors and other leading executives attending last week's one-day course on "Planning for Profits" held at the Birmingham Chamber of Commerce building heard this from Mr. J. Rawicz, an electrical and production engineer.

THE secret of materials management lies in realising that materials are an investment, whatever stage they may have reached in the buying-manufacturing-distributing cycle. As an investment they should be consistently managed to see that the optimum return is being obtained.

Mr. Rawicz, a consultant with Personnel Administration, organisers of the Birmingham seminar, effectively demonstrated how materials, which in many cases cost a great deal more than a company's labour, are not properly managed — because no one is directly responsible.

For the principal groups using them the materials are of only secondary importance. Each group has methods of measuring its efficiency, and none of them put the materials first.

To the sales department, materials are the products with which they are competing for customers.

To the designers, materials are the structural elements of performance, quality and reliability.

To production, they are an element of machine and manpower loading, and material economy is always subordinated to the principle of keeping the shop fully occupied.

To accounting, materials are an outlay of working capital funds, a cost of doing business.

Better saving

Yet a typical company financial breakdown may show that labour costs account for 15 per cent of turnover, materials 45 per cent, overhead, selling and distribution 30 per cent, and profits for 10 per cent.

In such a body, a ten per cent reduction in labour costs would increase the profit by 1½ per cent, but a ten per cent cut in materials costs would put the profit up by 4 per cent.

Opportunities for reducing direct material costs are twofold. They are: Paying less for supplies; Using less material per unit of manufacture.

On the first point Mr. Rawicz produced two examples both of which must have many parallels.

The first was a washer used as a ball-bearing spacer in the clutch mechanism of an oscillating electric table fan. When all the costs of the components were analysed it seemed that 8½d. was excessive in view of its simple function.

It was found that when the washer was first wanted four years before only one firm had tendered a quotation and naturally enough received the order (which perhaps they hardly wanted anyway).

Further quotations were obtained at the suggestion of the value analyst—with interesting results.

The original supplier quoted again, giving a price of 4½d. for each washer, explaining that the cost of tools had "now been recovered". Another supplier quoted 1½d. each, including the cost of tooling, for exactly the same washers.

Value analysis

If this suggests that some valuable returns can be gained from introducing value analysis, and doing some purchasing research, the second example, from the US is equally clear.

The item concerned was a pin ⅜in. long, and the thickness of a pencil lead. Its use was in a number of electric clocks and instruments. It was being bought at the rate of 50 million a year, and was thought to be fairly priced at a third of a cent each.

What the value analyst found when he asked the supplier to describe his operations is worth recording. There were 13 different production stages. The manufacturer was starting with a material so large that three centreless grinding operations were used to bring it down to size.

It would have been just as well to begin with smaller material and bring it down to size in only one step. The factory tolerance for the job had been set at half the purchasers tolerance "just so that he would not have any trouble".

Other odd things

Everything that fell outside this self - imposed tolerance, even though it came within the purchaser's tolerance, was being thrown away and charged to the job. Other rather odd things were also being done.

About a week after these inquiries the supplier requoted a price of about a fifth of a cent for the same pin. From all this—a saving of £40,000.

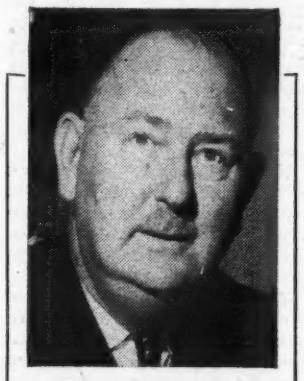
If, in the phrase of Mr. Rawicz, there are veritable deposits of gold dust hidden around the works, then it is necessary to have the right tools for the prospecting and of giving time to the research and knowing where to look.

The suggested tools, or techniques of materials management are five in number: value analysis; purchasing; waste control; quality control; stock control.

The essential of the value analysis technique is, "How much does this item contribute to the value of the product?"

There is an important difference between this and the question, "How much does it contribute to the cost of the product?"

Particularly in the US, the supporters of skilfully thought out



Mr. I. MARTIN, a director of Personnel Administration: "The standard of British management is still too low."

material operation, process or service costs have brought off some notable savings.

Companies like General Electric of America, American Ford, and also the US Navy have claimed savings worth millions of dollars each year. Their return on investment in value analysis is put at between 10 to 1 and 30 to 1.

Without sacrificing quality or delivery, or incurring excessive stocks, active purchasing tries to bring in supplies at the lowest overall cost.

The chief tool in this is purchasing research where an item is chosen for inquiry, and a systematic investigation made into prices, alternative sources, and possible alternative materials.

In the US detailed cost breakdowns are frequently obtained from suppliers in support of quoted prices.

Purchasing research needs its own controls to measure its effectiveness. Among the features of these controls are net direct purchases expressed as a percentage of the sales value of production; price reductions or discounts obtained during the period less price increases expressed as the net annual saving (or loss).

Other controls include the speeding-up of late deliveries by items or as a percentage of total deliveries due; the value of rejects expressed as a percentage of total purchases and the value of stocks of materials and parts (not finished products) in relation to the current annual rate of production at sales value.

The objective of waste control (otherwise known as yield control, or material utilisation) is to increase the output of good parts and finished products from a given amount of material.

The determination of the net material content of finished products and its relation to the total material used is the first step in calculating the yield percentage. For some materials the yield may be as low as 20 per cent.

There is an additional benefit in drawing up indices in that management and supervisory staff taking part are made aware of the waste that is going on.

Pilfering may account for heavy losses in valuable or attractive materials and in those where there is a ready market outside.

When too low a price is being obtained for scrap or when the waste is being put on the market in the wrong form, scrap disposal is not being adequately exploited.

One example of this is baled scrap metal which commands a higher price than loose swarf or press trimmings.

The inclusion of quality control as one of the tools of materials management was challenged from the floor by at least one engineer who believed that quality control lay in the hands of the production staff.

Mr. Rawicz drew a close connection between quality control and waste control and purchasing. Since quality control depends on standards derived from realistic quality specifications, which need to be considered in relation to the use of materials in the finished product, there is also a close link with value analysis.

Quality control should form an integrated system not only within the factory but extending to the suppliers. The emphasis in the system should be on prevention rather than discovery and rectification.

One company analysed the money spent on quality control and costs incurred by poor quality of supplies. It found that this divided out at 2 per cent on prevention of failures; 13 per cent on appraisal (inspection after receipt, laboratory tests) and 85 per cent on corrective action for failures incurred (cost of rejection, replacement, down-time).

For each £1 spent on prevention, £10 was saved on corrective action.

Capital tied-up

The importance of the part played in a company's success by its management of stocks is becoming increasingly recognised in a time of falling profit margins.

In the course of his talk Mr. Rawicz said that for some companies the amount of capital tied up in stocks could reach 50 per cent of the total employed in the business. In an emergency this could not readily be turned into liquid capital.

The cheapest and most effective method of controlling stock relies on the application of the Pareto principle.

Briefly stated this principle means that in any series of elements to be controlled a selective number of elements always account for the greater proportion of the effect.

In a stock inventory a small percentage of the number of the items held will always account for a large amount of the value in the same way that in an assembly a small number of the total components will account for a larger part of the cost of the unit.

The application of Pareto to stock control means tight control over, say 30 per cent of the items accounting for 70 per cent of the total stock value and relatively looser control over the other 70 per cent of the items which together account for 30 per cent of the value.

This should avoid a requisitioning system which costs more for each transaction than some of the items requisitioned

Fierce competition

The speaker who pointed out to Mr. Rawicz that stock control was an essentially static concept and that he preferred the term stock flow control received general support from those taking part. Mr. Rawicz swiftly conceded that stock flow control was an excellent term.

Opening the seminar in which papers on management controls, product profitability and the profit plan were also given Mr. T. Martin a personnel administration director with special responsibilities for the Midlands declared that their theme was how a business enterprise should plan, and set about achieving the profits essential for survival.

It seemed likely that in a few years at most we would become a member of the European Economic Community facing in the Home Market some of the fiercest competition we had ever experienced.

How manufacturing industry would withstand this surge of competition, and how its products would fare in Continental markets depended on management.

"The standard of British management is still too low. If companies take steps to raise the level, they have nothing to fear. But the company that fails to do so, will be failing to adapt itself to the new conditions in which it finds itself, and will be signing its death warrant."

Yields on some principal materials used by a domestic appliance manufacturer.

	Per cent Yield	Per cent Waste
Sheet and strip materials	67	33
Bar materials	52	48
Diecastings	88	12
Plastic mouldings	82	18
Paint and enamel	27	73

POWER CONTROL SYSTEMS FOR TOMORROW

TRANSISTORS GIVE HIGHER SPEEDS

by

N. G. HINGORANI

M.Sc., Ph.D. of the Loughborough College of Technology

IN general any new device (such as a semiconductor device) cannot be accepted for protection systems, and to a large extent for control systems, until it has proved to be reliable over a long period of service, or has generally been accepted as being reliable. So far, the control and protection devices have mainly consisted of electromagnetic devices incorporating moving parts. With the present-day development of power systems, however, the requirements for accuracy, speed and sensitivity are becoming more and more stringent and the simultaneous development of semiconductors (consisting mainly of diodes and transistors) has opened up possibilities of using semiconductor devices.

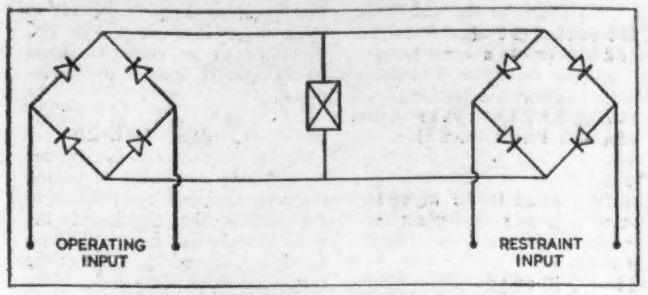


Fig. 1. Rectifier bridge amplitude comparator.

THE advantages of semiconductor devices over elecromagnetic and other non-static devices in general are as follows:

(1) High accuracy.

(2) High speed. An important feature here is that the speed can be maintained even near pick-up, i.e. near set operating level.

(3) High sensitivity.

(4) No moving parts. This is important in that there are no contacts, bearings or gears to maintain, and there is no possibility of chattering due to bouncing of contacts.

(5) Quick reset. This is a necessary feature in protective devices for a system which has a provision for automatic reclosing.

It is necessary for the protective device to reset quickly in order to be ready for correct re-operation if the fault recurs on the circuit-breaker closing.

Since the majority of faults in power lines are temporary, and disappear as soon as the line has been isolated and a short time elapses for the de-ionisation of the broken-down dielectric, automatic reclosing is desirable, particularly for high-voltage power lines, in order to prevent system instability, and ensure continuity of supply.

(6) Universality. Electronic devices mostly consist of standard circuit components like bistable, monostable, astable, logic, amplifier and comparator circuits, etc. Introduction of printed circuits has greatly contributed to the facility for quick replacement and interchangeability of such standard units.

(7) Low power consumption. The power consumption of control and protection devices is of two types:

(i) Auxiliary power from the station. This supply has to be reliable and independent of the main system. Semiconductor devices have such low power consumption that this can be supplied from long-life cells.

(ii) Operating power from the system itself through voltage transformers (v.ts) and current transformers (c.ts).

Power requirements

It may be pointed out in this respect that a standard power system c.t. for protective devices has to provide an output of 15 VA, whereas most complicated semiconductor protection devices will need a c.t. output of no more than 2 VA. Thus the size of c.ts and v.ts can be greatly reduced and design simplified. This advantage is of considerable economic importance since c.ts and v.ts for high voltage systems are very expensive.

Cost and reliability

With so many advantages the question naturally arises as to why semiconductor devices are not being widely used. There are two important factors which have to be taken into account for any device to be used for control and protection. These are:

(1) Cost. Until recently the cost of semiconductor devices has been quite high, but with improved production techniques and competition, the prices have been greatly reduced and are likely to be reduced even further.

(2) Reliability. This factor outweighs all other considerations and is the main reason why thermionic valves which have most of the advantages above, found very little application in power systems.

It would be appropriate to say here that among various semiconductor components, silicon and selenium diodes have generally been accepted to be reliable and used in a number of control and protection devices in power systems. A typical example is the rectifier bridge amplitude comparator shown in fig. 1.

But the major extension of the use of semiconductors is, of course, the use of transistors. Although considerable effort has gone into the development of transistor devices, transistors have yet to be generally accepted for control and protection of power systems.

Among transistors, germanium types are considerably temperature dependent and hence liable to "thermal runaway"!

Silicon transistors, on the other hand, have superior temperature characteristics and are also more capable of withstanding transients. However, silicons transistors have, until recently, been rather expensive, and very much so compared with germanium transistors.

Transistors and semiconductor diodes could replace thermionic valves in future h.v.d.c. projects. In many industrial rectifier and invertor plants, semiconductor devices have been introduced.

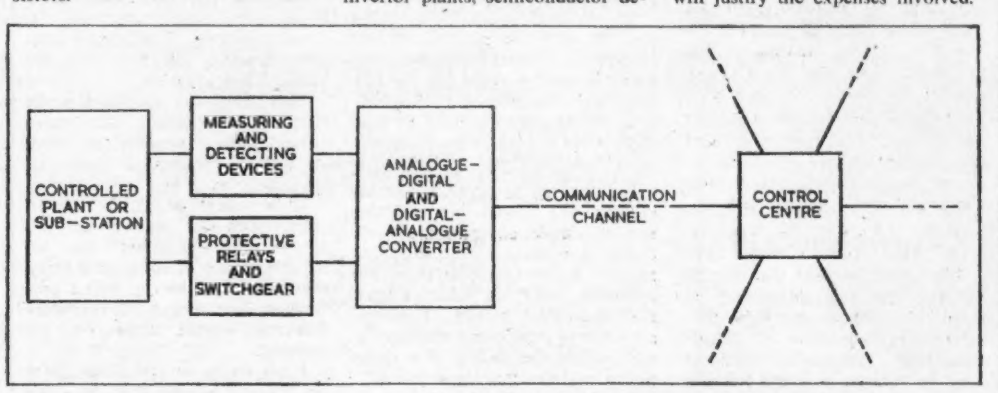


Fig. 2. Centralised remote control of power systems.

Informed opinion is that transistors are reliable enough to be introduced at least into the fields where reliability requirements are not very stringent. Some of the possibilities are given below.

Some control and protection schemes exist which cannot be accomplished without electronic circuitry. Such schemes, using thermionic valves, have been accepted in power systems, although when used they always have backup protection. Typical among these is carrier protection.

Another more important field is the control and protection of high voltage direct current (h.v.d.c.) transmission schemes. In h.v.d.c. transmission, in which large power is involved, electronic devices are accepted without reservation, due to the fact that effective, satisfactory and reliable control and protection could not be achieved without fast acting devices.

Two h.v.d.c. systems, one between Gotland Island and the Swedish mainland started transmitting 20 MW, in 1954 and the other, the English Channel scheme for transmitting 160 MW between France and England, are expected to be ready for commissioning by the end of this year; both incorporate control and protection devices using thermionic valves.

It may be said that, in general, requirements of reliability need not be as stringent for control devices as for protection devices. For this reason transistor devices are likely to be introduced for control purposes first and then for protection purposes. Examples of some control devices are: automatic synchronising devices for synchronous machines, automatic tap changing devices, voltage regulation devices, etc.

With the growing complexity of power systems, the necessity for providing centralised remote control and protection is becoming more important, and semiconductors can play a major part in these schemes.

Such schemes will be of the nature shown in fig. 2, in which the controlled or protected plant or substation is provided with the devices which measure voltage, current, and power factor.

Analogue to digital

These analogue quantities are converted into digital form for transmission to the control centre through the communication channel. The central control which will contain a digital computer with necessary displays, etc., will compute and give the necessary orders to each controlled station. There are two distinct schemes of the above nature:

(1) to operate a grid system in an efficient and economical manner, it is necessary to work out the programme of generation and power transfer for each station. This programming depends mainly upon the load conditions, and the practice is to work out such programmes in advance by taking into account the average day-to-day and seasonal variations of load in different regions.

This operation can be made automatic by a central control which takes into account the actual load conditions as they occur and works out the optimum control for each station. In such a scheme, accuracy will be of prime importance, since it may be necessary to control various parameters within 0.1 per cent accuracy. This scheme will also require a very elaborate computer centre and it is doubtful whether the saving in power losses will justify the expenses involved.

(2) With power systems getting more and more complicated the correct discrimination of switch gear operation is becoming more and more difficult. One of the problems caused by the interconnected networks is the possibility of successive tripping causing widespread shutdown.

When a fault occurs on one part of the system, it is cut off by its circuit breakers and the whole of its load is thrown on the rest of the system, which may cause the overloading of some other section of the system and develop into successive tripping of the sections (c.f. recent blackout in London).

Simple circuits

Such occurrences can certainly be avoided by a centralised control which senses such an occurrence and prevents successive trippings by cutting out some of the load.

In such a scheme, the computer will be simple, consisting largely of logic circuits. Since this central protection will be overriding the normal protection provided on each item of a power system, the speed of the whole operation will be of prime importance. The time allowed for the whole operation may be less than 10 m.sec. from the moment of occurrence of the fault.

Opinions differ as to whether or not electrical power system engineers have been too conservative in not accepting transistor circuits for control and protection, but to the author it seems time full use was taken of the advantages of such devices.

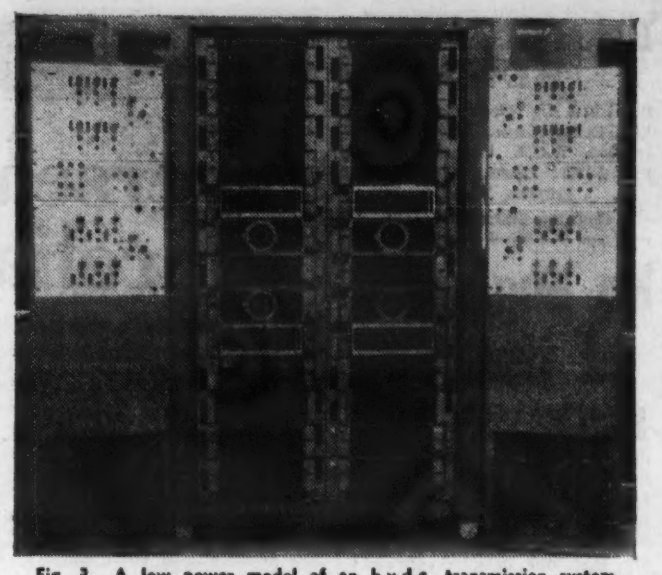


Fig. 3. A low power model of an h.v.d.c. transmission system employing semiconductor devices for control and protection. (Manchester College of Science and Technology).

Unified limit and fit systems

WORLD STANDARDS

THE need for the unification of the various national system of limits and fits has long been considered of prime importance and at the first conference of the International Federation of the National Standardising Association (ISA) in 1926 the study of limits and fits was listed as one of the essential tasks.

It was not until 1940, however, that ISA published Bulletin No. 25, the first International Recommendation on limits and fits. It gave recommendations on a system of tolerance, a system of fits, and a system of gauges, and covered sizes from 1mm. to 500mm.

With the formation of the International Organisation for Standardisation (ISO) in 1946, international work on limits and fits was continued by Technical Committee TC 3.

After 20 years the ISO committee, under the Secretariat of France, have produced Draft ISO Recommendation 321 which is intended ta supercede ISA Bulletin No 25, where applicable. The ISO Recommendation has extended the range covered by the ISA Bulletin and includes tables of tolerance for sizes below 1mm. and provisional recommendations for sizes above 500mm. It also gives tolerance and limits in inch units.

National standards bodies throughout the world still recognise ISA Bulletin No. 25 as the International Recommendation and from Europe comes the news that Germany has recently issued DIN: 7153 and DIN: 7168 based on the ISA system, "Tolerance Zones of Holes and Shafts" and "Allowable variations in Dimensions Without Tolerance Indications", thus supporting the United Kingdom in the adoption of the ISA system of limits and fits published in BS. 1916.

Also supporting the International Recommendations are the recently published standards from the Netherlands: NEN: 2800, Parts I, II, III and IV covering the "International System of Limits and Fits, Definitions, Tolerance, Basic Limits, and Classes of Tolerance for Dimensions."

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ENGINEERING NEWS

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Thursday, December 7, 1961

No engineers at the top

IT has been said that Battle of Britain II will be fought during 1962 and that it will be as fierce and as bitter as the Battle fought in the air over our coasts in 1940. Perhaps this is a little dramatic, but it is a timely warning that our national survival will depend on our ability to fight the battle for world markets against ruthless competition from Germany and the U.S., and eventually from the U.S.S.R.

In this "war" engineering will play a major role and we must strain every nerve to make our industry efficient. But British Industry will never be fully efficient until there is a higher proportion of scientists and engineers on boards and in executive positions, according to a statement last week by Sir John Cockcroft, the nuclear physicist.

☆

The engineering industry in Britain is certainly not well off in this respect and a look at the qualifications of many of our leaders shows an abundance of accountants, salesmen and financiers, but very few engineers. Many engineering companies have no engineers at all on their board of directors and we believe this to be wrong.

Before the balance can be adjusted we need more high grade engineers. In spite of the warning of pessimists who believe that the output of engineers will rise to the point of overproduction in the next ten years, there is no sign of this at present.

☆

Dr. F. A. Vick, director of A.E.R.E., Harwell, speaking at an I.E.E. Section dinner last week, pleaded for more high-grade engineers; we have heard from many other branches of science and technology of the serious shortage of really good men.

Attempts are being made to step up the numbers of qualified engineers, but quality is just as important as quantity and until firms are prepared to open up their senior posts to technically qualified men, many of the experts will be lost to industry—maybe even to the country.

Tomorrow's technology

Great interest is being shown at present in direct methods of producing electrical energy from chemical or nuclear fuels. One of the most promising methods is a process called magnetohydrodynamic (MHD) generation.

In principle a jet of very hot highly ionised gas is passed through a magnetic field which separates the positive particles and the electrons. These can be collected on electrodes which become the terminals of the generator.

It is thought that by using radial magnetic fields, alternating fields or inductance variation an MHD generator could produce a.c. power. High efficiency and high power/weight ratio are expected to be amongst the advantages. — SCANNER

An Engineer's DIARY

Overseas trade hit by unreliable deliveries

Senor Rafael Eduardo Castillo Valdez, the 500th scholar to visit Britain under the FBI Scholarship Scheme. Left to right: Sir Keith Joseph, Senor Castillo Valdez, Mr. C. E. Harrison, President, the FBI.

I HAVE noticed that a large proportion of engineering apprentices express a strong preference to join the sales rather than the manufacturing side of the industry. Sales has a certain glamour, a degree of freedom and the possibility of an expense account, all of which make an appeal to the young man who views a clocking-in factory existence with contempt. The possibility of foreign travel is an additional lure of sales.

Perhaps those young men with ambitions towards overseas sales should first seek the counsel of men like J. B. Scott, export director of Crompton Parkinson, who was awarded the C.B.E. for his tremendous personal effort in promoting East-West trade.

He told me last week: "Exporting is not fun."

Mr. Scott has visited 10 countries this year and everywhere he got complaints about late deliveries and broken promises. He was asked "Why are you always having dock strikes?" and "What is a tea-break strike?"

The frustration felt by engineers who complain that their companies will not let them develop new products is nothing to the feeling of overseas salesmen who land large export orders, only to be let down by lethargy, strikes and downright inefficiency at home.

Export goodwill

Too often we hear that British industry is not doing all it should in the export field, but surely the Federation of British Industries' scholarship scheme must be forming a sound foundation for the future.

Last week Sir Keith Joseph. Minister of State, Board of Trade, presented Senor Castillo Valdez with a certificate as the 500th scholar to visit this country under the F.B.I. scheme. Senor Valdez was formerly a student at the University of San Carlos, Guatemala, he graduated from the Brighton-Young University at Utah, U.S.A., and then joined the Empressa Electrica de Guatemala.

He will be in this country for a period of two years, and will spend 21 months at James Williamson and Partners of Glasgow, a civil engineering concern.

Since 1950 when the scheme first started scholars have been brought to Britain from 39 lesser developed countries for training.

Super sonics

Probably because of our educational system the arts and the sciences are usually separated by a barrier which prevents one individual from having a leg in both. This barrier is purely artificial because many of my colleagues are seriously interested in music and this suggests that one can be artistic as well as logical.

Perhaps it is an attempt to knock down this barrier that prompted Mr. Philip Cannon to produce his new cantata, *Son o' Science*, which was performed last Saturday by the Aylesbury Choral Society. It was commissioned through the National Federation of Music Societies and deals with the dilemma of an individual overwhelmed by the pressure of the machine age.

Mr. Cannon might now concentrate on a *Jet Age Symphony*, inspired by London Airport, and if he does I can assure him of a sympathetic hearing!

Sound idea

Does the small manufacturer realise that the flexibility of his organisation lends itself to low cost automation? Mr. Landon Goodman, industrial specialist of the Electrical Development Association, thinks not, and said so last night when talking to the Kingston Area Productivity Association.

He went on to say: "A feature of low cost automation was the use of simple equipments which could be employed over and over again. A few examples were: air cylinders, solenoids, valves, timers and photo-electric cells. The construction of equipment was usually well within the ability of a competent maintenance department."

I must heartily endorse these sentiments since I have been concerned in applying such simple expedients to the making of prefabricated wiring systems.

By introducing flow-line techniques, coupled with automatic procedures wherever possible, manufacturing costs were reduced by 20 per cent. Equipment costs were not high and savings speedily covered the outlay, apart from taking the tedium out of previous methods. No labour was laid off, but the product was more competitive.

Mr. Goodman would also like to see a Department of Automation set up which would "publish concrete and unbiased knowledge and do much to dispel fears engendered by lack of experience and ignorance". This seems a sound idea, but I am sure that small firms could do much through their own initiative.

Cold lunch

When I read of the unfortunate engineer who pulled the wrong switch and neatly cut off power supplies in Kent, Surrey and East Sussex my sympathy went out to him.

I remember confidently fitting a new element to my wife's iron and after connecting up to the thermostat and replacing all covers I switched on. There was a blinding flash which caused my dog to pass effortlessly through the sound barrier, while my open mouth filled with smoke.

The cost of this experiment was the wrath of my wife and the price of a new iron. She would not trust any more repairs on that particular equipment.

I think her reactions were reasonable and I hate to think what thousands of housewives must have thought of the engineer who ruined their Sunday dinners.

Yet this man, working on the commissioning of a new generating set, made a relatively smaller error than I did but with far greater consequences.

This leads me to the thought that in engineering the more complicated a process the more devastating a trivial error of judgement may be.

If a clerk in stock control requisitions 20 instead of 200 screws per assembly for an involved piece of equipment being mass produced, he can stop a production line and have operators booking wasted time on his account.

It all seems to put a new slant on the old saying that, "it's the little things in life that count".

Film break

A short while ago, I saw a colour film on the manufacture of high-grade tool steels by steelmakers Jessop Saville of Sheffield. From the comfort of the cinema seat, I saw furnaces being tapped and white hot ingots of steel being pommelled like so much soft cheese to rid the ingots of impurities.

The film is a good addition to a number of similar films of this type that have been produced by industry which have educational value not only to engineers, but to others outside the industry.

Among first-class films of this type, presented with little advertising content, a series produced by the Shell organisation springs to my mind. I was late on this occasion, and it was not until towards the end of the film when captions were shown that I realised who produced it.

Films of this nature can often be obtained by approved borrowers at little cost. I think more use could be made of this facility by firms to give an occasional break in company time to workpeople chained to the bench or assembly line where a free half-hour show could give a degree of mental uplift which benefits all concerned.

V-break

A Russian trade delegation touring Blackhawk Ltd.'s new factory at Park Royal were offered mid-morning tea as typical British gesture of good will. The delegation leader, M. Generalov, politely refused, saying his party would prefer not to interrupt the visit.

A Vodka break might have been more to the point and I suggest someone tries this to overcome the T-break trouble.

John Heywood

SOVIET ENGINEERING

by our own correspondent

Controlled air system for blast furnaces

A SCHEME for the automatic control of the air distribution in the tuyeres of a blast furnace is reported from the Ukrainian Scientific-Research Institute of Metals (Mekhanizatsiya i Avtomatizatsiya Proizvodstva, No. 10, 1961).

The system devised which is already claimed to be in operation at a metallurgical plant (unspecified!) performs the following functions.

Firstly, it automatically maintains the pre-set strength of the blast through the tuyeres — this may be identical for all the tuyeres or in a set relationship depending upon the working of the furnace.

Secondly the controlling choke valves in the tuyere sleeves are set in the open position when the air pressure in the ring tube rises or falls beyond the allowable limits.

The individual choke control valves are remotely controlled by hydraulic means from an instrumentation panel. The air discharge at each tuyere is recorded.

Each tuyere has its own controller but all work on one main impulse which responds to the air load and resistance of the furnace.

* * *

This main impulse is the pressure drop at a diaphragm which measures the amount of additional air withdrawn from the ring tube.

The system operates by comparing the air discharge at each tuyere with the main impulse. The pressure drop is picked up by a differential manometer and converted to an electrical signal by transducers fitted in the manometer.

* * *

Soviet scientists do not appear to be losing much time in getting down to their own contribution to the task — the laying of the material-technical basis of Communism—adopted by the recently concluded 22nd Communist Party Congress in the name of the entire Soviet people.

At a general meeting of the Academy of Sciences, on November 15 in the House of Scientists, Moscow, the president of the Academy, Mstislav Keldysh, reported that Science Councils have been established which will be responsible for co-ordination of scientific work, planning research and introducing the results of that research into industry.

Co-ordination of work on the important theoretical problems of the natural and social sciences will be undertaken by Science Councils attached to the Academy of Sciences.

These problems will derive from the State plans as interpreted by the State Committee for the Co-ordination of Scientific Work of the USSR Council of Ministers.

Academician Keldysh emphasised that "the Science Councils will concentrate their attention for the most part on the search for new more effective methods for converting the various forms of energy into electricity".

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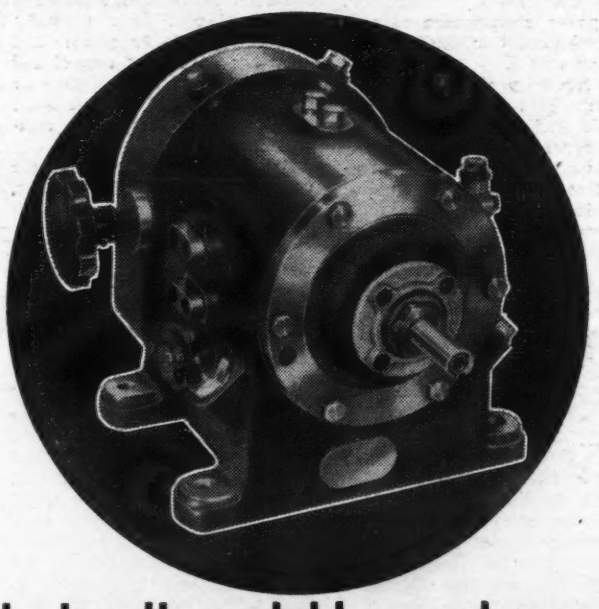

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PRODUCTION INSTITUTE LAUNCHES JOURNAL

FIRST issue of a quarterly journal devoted to research work in production—The International Journal of Production Research—was published by the Institution of Production Engineers this week.

It is intended to cover all aspects of production, including production policy, planning and control; industrial skills; productivity measurement and production processes in all technologies.

It will consist of original reports by university and industrial research workers for the benefit of other research workers.

Professor N. A. Dudley, Head of the Department of Engineering Production at Birmingham University, has been appointed editor and there will be an international panel of consulting editors.

Production study

The first issue contains articles on selective assembly, the machining of high strength materials at elevated temperatures, and an electrical analogue for solving transport problems.

Professor Dudley in his editorial, states that the study of production is slowly emerging as a science in its own right.

It is anticipated that the circulation of the journal will be in the region of 1,000 during the first year, and there are plans to publish it in French and German as well as English.

ULTRASONIC TESTING HELD BACK BY LACK OF FACTS

by our ELECTRONICS CORRESPONDENT

NEW electronic techniques in non-destructive testing formed the subject of a one-day conference held yesterday at the Wolverhampton and Staffordshire College of Technology.

Six papers were presented to the gathering which was sponsored by the West Midland Section of the Institution of Radio Engineers.

More must be known about physical factors involved before any real advance can be made in the field of ultrasonic testing.

This was the contention of Mr. L. Kay (Birmingham University) in discussing the reliability of ultrasonic non-destructive testing.

Little reliable information is available on the propagation of stress waves in a metal. Before the frequency of operation of a testing device can be decided, material characteristics must be related to the scattering and absorption which may be expected over a wide frequency range.

Mr. M. D. Chattaway (Tube Investments Technological Centre) discussed the automatic charting of ultrasonically detected flaws in bars. He pointed out the limitations of the conventional oscilloscope display in providing a physical picture of a defective area.

Details of the X-ray image intensifier were given by Mr. C. E. Paine (Research & Control Instruments). This provides an image that is 1,000 times as bright as the normal fluorescent screen with less than half the grain size.

A visable image of the ultrasound intensity distribution on the quartz face can be produced on a cathode-ray tube by an ultrasound image camera.

Mr. C. N. Smyth described how the ultra-sound originates from a lead zirconate titanate transducer and is propagated as a plane wave down a tank filled with a suitable fluid.

Tank immersion

The object under investigation is immersed in the tank between the transmitter and a perspex lens.

The latter focuses the ultrasound emerging from the object on to a quartz crystal with an X-cut. At each crystal point an alternating piezo-electric voltage arises which is measured by a scanning electron beam.

The video signal is converted into an image as for conventional television techniques.

Mr. D. R. Aldridge-Cox (Tube Investments Technological Centre) maintained that automatic inspection devices can have most of the virtues of the human operator and none of his failings.

He described two methods for classifying and measuring surface defects. The first system used defect length as the only criterion, the second considered defect length, width, and depth.

A technique of homing and defect following is employed and it is not restricted to optical transducers, but could be applied to eddy currents and ultrasonics where a scanning system is incorporated.

Equipment for detecting flaws in steel tube or bars was described by Mr. W. H. Baker (Tube Investments Technological Centre) which uses eddy currents or magnetic flux leakage to indicate flaws.

A planetary scanning coil is rotated at high speed around the tube and incremental permeability is reduced to approaching unity by using an intense magnetic field.

COPPER CLAD LAMINATE

COPPER clad laminate suitable for printed circuits which can be punched at room temperature has been produced by Formica. It is basically similar to the XXXP-36 laminate made by Formica of Cincinnati.

The laminate now produced in this country has been designated Formica XXXP-IC. It is particularly suitable for the mass production of printed circuit boards since dimensional changes caused by hot-punching are avoided.

The base material has a degree of flexibility, good electrical properties, low moisture absorption, and good adhesion.

The material is a cotton-paper impregnated with resin and dried in ovens. It is then mut into sheets and formed into packs.

The copper foil coated with an adhesive is then applied to one or both outer sheets and the whole laminate compacted under heat and pressure.

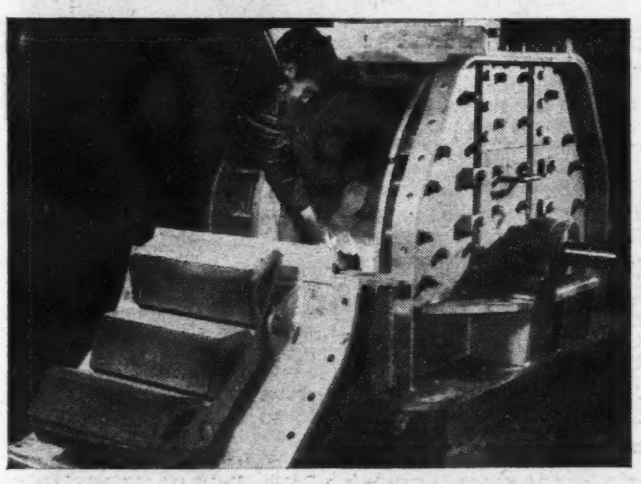
Scrap baler from U.S.

A HUGE steel scrap-baling press for automatically processing furnace scrap has been installed in the Scrap Preparation Yard of the Steel Company of Wales.

It can produce 6,000lb bales at the rate of 45 per hour and with its weight of 365 tons it is believed to be one of the largest balers in the world.

A 100-ton floating crane had to be used to unload the sections when they arrived at Newport Docks from the U.S.A.

GEC produce crusher machines at Erith



A type CD impactor with one of the hinged covers opened to show the rotor, hammers and breaker blocks. It is being assembled at the Fraser & Chalmers Works of G.E.C. (Engineering), Erith.

A RANGE of Pennsylvania reversible impactors with capacities of up to 1,500 tons per hour is now being manufactured at the Fraser & Chalmers Works of G.E.C. (Engineering) at Erith, Kent.

These crushers are the first of their type to be made in the U.K. and are particularly suitable for refractory, metallurgical, lime, cement, gypsum, and quarry industries.

Impactors are generally used as secondary crushers, being fed from a primary crusher product of up to 18in, top size and reducing to about ¼in. depending on the size of the crusher and the setting of the breaker blocks.

Material dropping down a high, centrally located, feed chute falls into the path of oncoming hammers which shatter it, the particles then being driven against massive side-wall anvils.

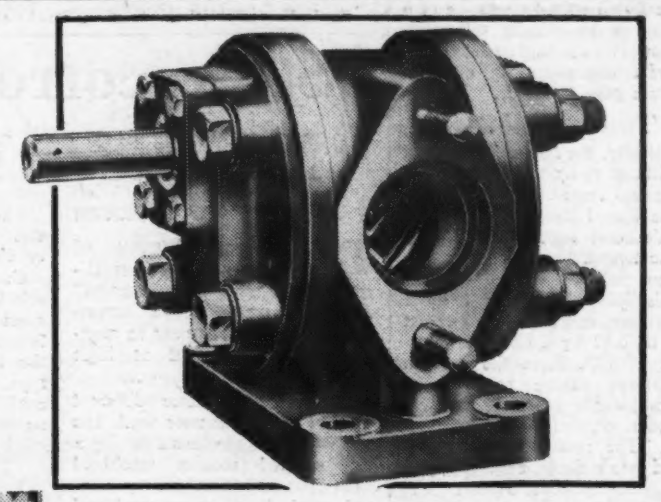
A second crushing action occurs here, the particles then rebound into the hammer circle where the cycle of operations is repeated until the crushed material is swept out through the open bottom.

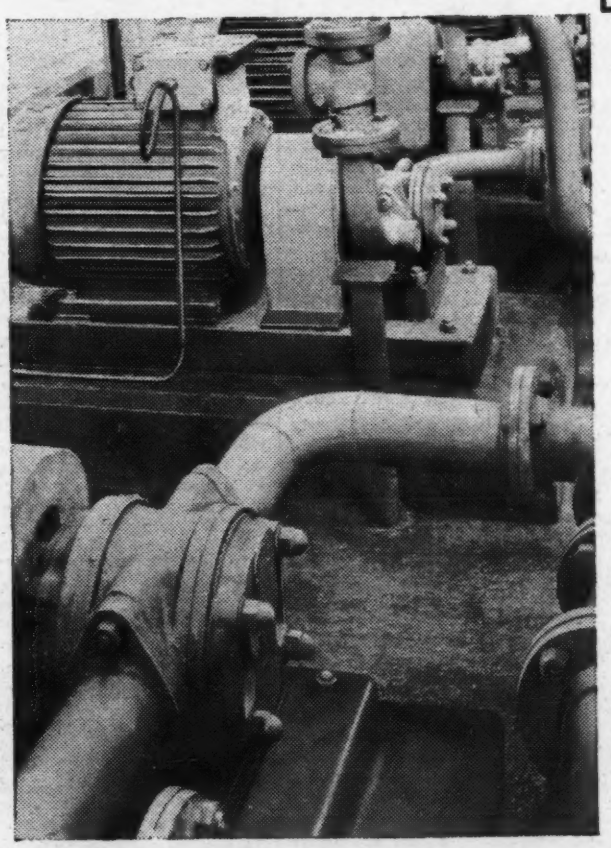
Since impact energy varies directly as the particle mass and the square of its speed, the larger the fragments surviving the first impact-rebound cycle the harder they are hit again. Consequently the harder they are driven against the anvils or breaker blocks.

Small, finished particles cease to rebound and are swept from the active reduction zone. Thus the impactor applies breaking power in direct proportion to particle size, giving selective reduction.

An important feature of the Pennsylvania impactor is the contour of the breaker blocks, which are so shaped as to give a cubical product at a high rate of reduction with minimum wear.

When smooth pre-determined flow is essential . .





. . specify David Brown

ROLOID

gear pumps

The characteristics of Roloid Gear Pumps make them particularly suitable for low pressure, high delivery of any form of liquid with lubricating properties. The rate of flow can be pre-determined to a remarkably fine degree, due to the high, constant efficiency, and the pump maintains its performance throughout its long life Factors contributing towards this high efficiency are teeth that are accurately cut and meshed across the full face of the gear, and roller-bearing mounted rotors. But, of course, you expect top standards from a gear pump made by David Brown—the acknowledged experts in gearing!

Roloid Gear Pumps are made in a range of sizes for deliveries of up to 600 gallons per minute, and at pressures of up to 300 p.s.i. If your needs come within these limits, consult David Brown!

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OA/7345

.....FOREIGN NEWS.....FROM OUR OWN CORRESPONDENTS....

INFRA-RED TESTS FOR COMPUTER CIRCUITS

NEW YORK

A TECHNIQUE called thermography, used for measuring the operating temperature of conductors and electronic components applied in a computer circuit, is under development by engineers of IBM's General Products Division Development Laboratory, Endicott, N.Y., using equipment of Barnes Engineering Company, Stamford, Conn.

The approach permits IBM to measure temperature levels and gradients on printed-circuit cards.

The use of an infra-red scanning camera produces visible measurements by photographing the heat emitted from a circuit board.

By visually comparing the grey tones with a reference strip (automatically inserted into each photo), or by making this comparison with a densitometer, accurate determinations of temperature may be made.

Two assemblies

Basically, the Barnes i-r camera consists of two assemblies: radiometer and scanning system.

The filtered radiometer generates an electrical signal proportional to the temperature of the instantaneous field of view.

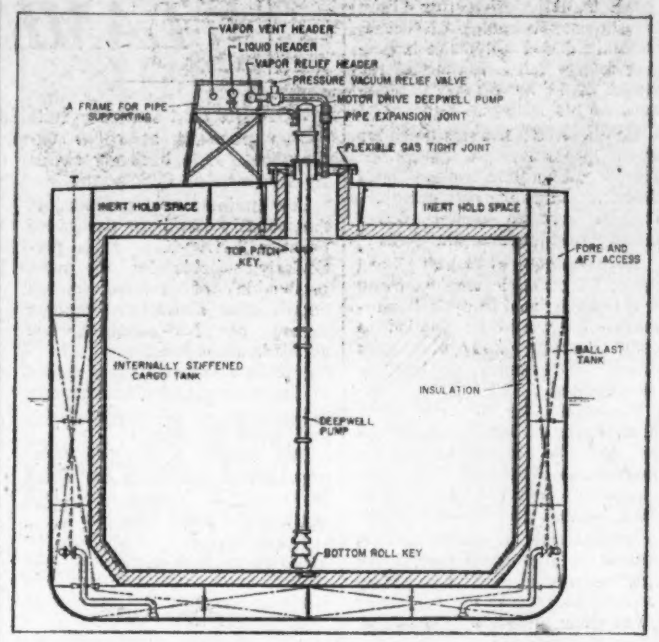
This field of view is 1 by 1 milliradian, equivalent to a target area of 0.12 by 0.12in. at a distance of 10ft. from the camera.

Infra-red energy received by the radiometer is compared with its own internal radiation standard. The measurement is converted into a signal, amplified, and fed to the electronic system.

A glow-modulator tube in the scanner is controlled by this signal, so that its brightness varies directly with the temperature of the instantaneous target area under investigation. The tube glow is reflected onto film as the record.

WHY [redacted] STABILO assists? PAGE SEE 16

U.S. PLAN FOR LIQUID GAS TANKERS



Typical section through cargo tank of M.V. Methane Pioneer.

Naval architects consider design

NEW YORK

AN interesting paper by C. G. Filstead and Montgomery Banister on "Low Temperature Liquified Gas Transportation" was presented to the Society of Naval Architects and Marine Engineers in New York last month.

The paper details the design aspects of liquid gas carrying ships and relates these to the gases carried and types of receiving terminals used.

Basic factors which must be considered involve the number of divisions in the tanker and the type of insulation to be used, the boiling point of the gas and the difference in density when evaporated.

In deciding the thickness of tank insulation it is necessary to consider its thermal conductivity and cost, the value of the space it occupies, how much vaporisation can be allowed, and the cost of reliquifying. If boil-off is used for power generation the cost of fuel oil must be related to it.

Deep-well pumps

Characteristics of the ship's motion at sea must also be considered when stressing the cargo areas and auxiliary equipment.

Aluminium and bronzes are acceptable materials for pumps and valves, while stainless and nickel steels are suitable for piping. Where the fire risk is low aluminium pipes may be used.

Pumping liquid out of the tanks is usually done by deep-well pumps with boosters at the deck end of the piping.

Another method finding favour is the vapour-lift pumping system, its attraction being that there are no moving parts in the cargo tank. The lift comes from lowering the pressure in a separator tank which is connected by suction line to the bottom of the cargo tank.

Boiling from decreased pressure lowers the density of the fluid in the lines and the difference in head between the tank contents and the suction pipe forces it into the separator. Pressure in the latter is maintained by a gas compressor.

All liquid gas carrying vessels have an artificial atmosphere in the holds to exclude atmospheric moisture. This often takes the form of nitrogen maintained at a pressure slightly above atmospheric.

Throughout the paper the aspects discussed are backed by statistics and graphs which help to make its presentation both lucid and authoritative.

CRANK PRESS USES MAGNETIC CLUTCH

BRUSSELS

A RANGE of presses of completely new design has been introduced by the Belgian A.T.C.M. firm. The machines are of the crank type with magnetic clutches and models of 20, 30 and 50 tons rating are available.

Flywheel and magnetic clutch are mounted directly on the driving shaft of the motor and it is possible to set the machines for single-stroke or continuous operation.

Brake and clutch are interlocked so that they cannot operate together. Complete all-round guarding with automatic closing mechanism as standard and double stroking is prevented by a safety device.

Stress-corrosion in MS alloys studied

WASHINGTON

THE National Bureau of Standards recently investigated the "incubation period" that occurs before stress-corrosion cracks appear in magnesium alloys tested at high strain rates.

In this study, three different types of specimens were used. The first two sheet specimens having a ¼in. reduced section, machined from 116 and 1/8in. thick material, and notched specimens machined from ¼in. diameter extruded rod were employed to investigate the incubation period.

The third type, made from the extruded rod with 2-in. long reduced sections having a 4-in. square cross section, were used in locating the crystallographic planes of crack initiation.

Specimens were placed in cells to which a corrodent was added and they were subsequently stressed in direct tension by means of lever systems.

The resulting strain or extension was followed either manually or electrically recorded.

Concurrently the electrochemical solution potentials of the specimens were determined with reference to a calomel electrode of the saturated potassium chloride type. The extension and potential could be recorded simultaneously on a two-channel oscillograph.

Extension rate

A curve derived from an analysis of the strain in a number of speciments showed that while most of the extension occurred on initial loading, the specimen continued to extend at a decreasing rate for 40 to 50 seconds. With the initiation of cracking the extension rate increased and failure occurred after a total exposure of about 150 seconds.

From simultaneously obtained data for the electrochemical solution potentials of the specimens, another curve was derived. This showed that on initial loading, the potential changed about 90 mV in an anodic or corrosive direction, and then over a period of from 40 to 50 seconds it slowly reversed about 10 mV in a cathodic or non-corrosive direction.

When stress-corrosion cracking started, the potential again increased in the anodic direction until the specimen failed. Upon failure, the potential reversed direction very abruptly, probably within 1 second, and became only 20 mV more anodic than it was before stress was applied.

Cold work

These curves suggest that with the application of stress the grains most favourably oriented for slip were initially deformed and hardened by cold work to resist further deformation. Protective oxide films destroyed in the initial deformation, were repaired.

The increase in potential in the anodic direction on initial loading was due to the rupturing of the protective film on these grains, and similarly the decrease in potential, noted during the ensuing 40 to 50 seconds, occurred as a result of film repair.

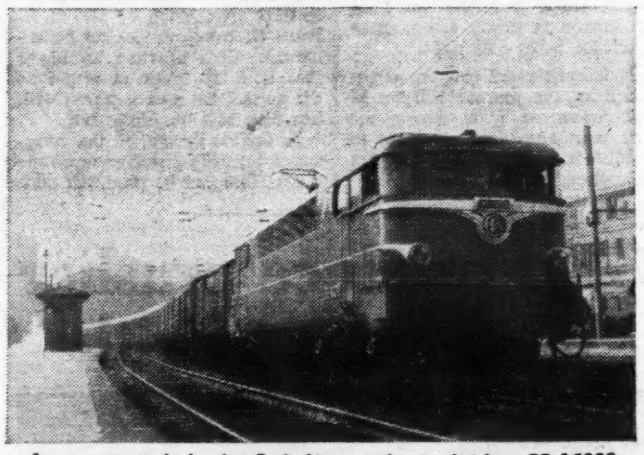
Data obtained indicate that crystals in which cracking occurred were generally less favourably oriented for slip than were those crystals in which no cracks developed.

MICA IMPROVES PAINT LIFE

CALCUTTA

IN an attempt to exploit in paints the unique properties possessed by mica — namely, its flexibility, thermal insulation, and resistance to acids, alkalis, and moisture, the Central Glass and Ceramic Institute, Calcutta, recently carried out a series of investigations which have shown that the addition of mica in powder form improves the effective life of exterior paints.

RAILWAYS PLAN FOR EXPANSION



A passenger train leaving Paris-Nord station hauled by a BB 16000 electric locomotive. These 4,920-h.p. units operate on the 25-KV., 50-cycle system and are equipped with ignition rectifiers. (French Railways.)

PARIS

A BUDGET of approximately £430 million has been fixed for improvements in the French railway system during the four-year period 1962 - 65. The nationalised railway authority S.N.C.F. (Societe Nationale des Chemins de Fer) anticipate that by 1965 suburban passenger traffic will be no less than 25 per cent higher than in 1959, and reach the total of 5,600 million passenger-miles a year.

For long distance traffic over the same period the increase is expected to be 115 per cent, that for goods traffic 132 per cent.

Priority is to be given to increasing the number of tracks at certain stations and junctions which are already operating at peak capacity and thus hindering increases in utilisation over the system generally. It is also intended to increase spending on railway buildings and dwellings to improve the working and living conditions of railway personnel.

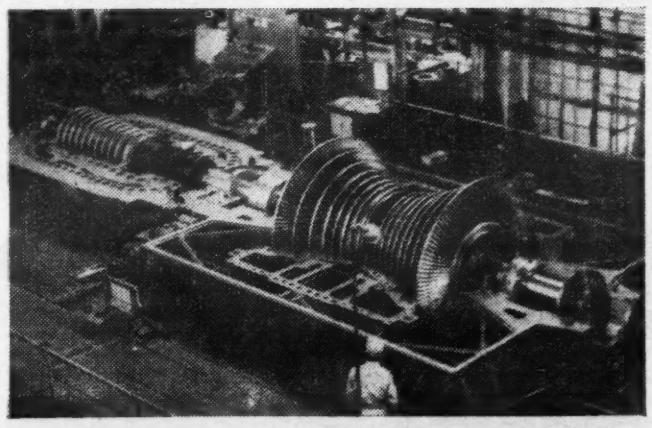
French National Railways are to replace 3,550 steam locomotives as a result of electrification and the introduction of diesel locomotives from 2,000 to 4,000 h.p. When the current programme of modernisation is completed there will be an additional 5,700 miles of electrified track and 75 per cent by weight of all traffic will be hauled by electric traction.

Single phase and d.c.

Some of the lines to be electrified will have single-phase systems while others will be direct current, and in some cases single-phase systems will be used even though the lines are extensions of routes already converted to direct current operation. Thus Le Mans-Rennes will be single-phase while Paris-Le Mans is direct current.

Consideration has been given in the current four-year plan to new installations required in the event of a Channel Link being constructed, whether bridge or tunnel.

JAPAN BUILDS 265 MW TURBINE



Largest machine of its type ever manufactured in Japan, this 165 MW cross compound reheater turbine has been produced by Tokyo Shibaura Electric Co., Toshiba, for the Yokosuka power station of the Tokyo Electric Power Co. Operating speed is 3,000 r.p.m. The manufacturers also supplied control instruments and safety devices.

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NEW Equipment

Sintering furnace has high vacuum

DESIGNED for the sintering of uranium and plutonium oxides, ceramics, etc., and at lower temperatures, for high vacuum brazing and degassing of small assemblies, this furnace is available either for glovebox working or general use.

The element consists of four tungsten strips formed into a tube, clamped in such a way that the cooling water pipes, which also carry the current, form a spring to reduce stresses in the element to approximately zero at maximum temperature. Between the coil and the element are tantalum radiation shields.

The furnace body is made in stainless steel and the samples for heating are loaded into a tungsten or tantalum crucible through the port. The charge capacity is about 2½in. long by ¾in. diameter, but it is possible to increase this.

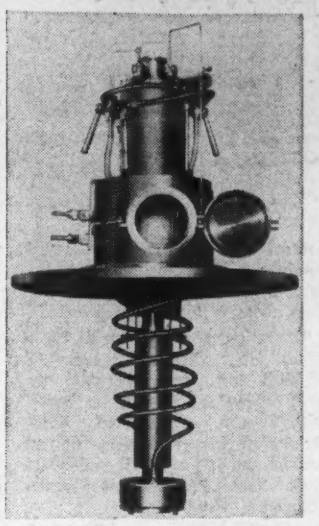
The vacuum system consists of a 3inch oil diffusion pump backed by a gas-ballasted single stage rotary piston pump.

A water flow relay is inserted in the water supply to the pump and furnace, and the stopping of the water causes power to be removed from the furnace and diffusion pump, and closes the isolation valve. Power failure also isolates the vacuum system.

Alternative power supply arrangements are provided, from manual tap-changing or stepless saturable reactor to fully automatic programmed cycle controls. The transformer is 12kVA, 415/25 volts rated and consumption in the furnace at 2,400°C in a 10^{-6} mm. hg vacuum is in the region of 10 kVA. It is possible to reach this temperature in five minutes from cold and without a charge, cooling to 200°C takes place in about 10 minutes.

For general use it is mounted on a cubicle measuring approximately 4ft. by 3ft. by 4ft. high. **Spembly Ltd., New Road Avenue, Chatham.**

Reader service reference No. 323



SINTERING FURNACE
10^{-6}mm. hg. vacuum

Six ton dumper

This machine has been designed to match the Massey-Ferguson 203 tractor. The main frame is of box section construction and the inclined skip floor is braced both internally and externally. Vacuum assisted hydraulic brakes are arranged to work in advance of those of the tractor, which eliminates the risk of jack-knifing and gives positive braking under full working load.

Heavy duty twin tip rams anchored to the main frame are fed by the tractor's internal hydraulic pump. **Massey-Ferguson, Coventry.**

Reader service reference No. 324

50 c.c. power unit

Weighing only 14lb., this 50 c.c. four-stroke, side-valve engine is basically a die-cast aluminium alloy unit with cast-in iron cylinder liner and iron valve seats. The unit has clean lines, uncluttered with petrol pipes, tank straps and bolts and the petrol tank is mounted as part of the cowl structure. A special petrol tap inside the filler cap allows the petrol pipe to be almost totally enclosed within the cowl.

A recoil starter is standard fitting and a standard pulley for emergency starting is also available by removing the recoil starter assembly. All external metalwork, excluding aluminium, is rust protected and stove enamelled. **B.S.A. Power Units, Studley Road, Redditch.**

Reader service reference No. 325

Turn to page 19 for Classified Advertisements and read about . . .

Machinery for sale
Capacity available
Business opportunities
Agents and Trade Services

Steam cleaner

A mobile, propane-fired, pressurised steam cleaner suitable for transport vehicles, civil and marine engineering, and plant and factory maintenance, the Magnus converts 60 gal. of water per hour to detergent impregnated live wet steam which is delivered at a controlled pressure of 20 to 100lb./sq. in Steam pressure is raised to 90lb./sq. in. in two minutes and the temperature of water and steam at the cleaning nozzle is 206°F. Fuel consumption is 10.25lb. propane per hour.

The pump is electrically driven and because the fuel is propane, there are no sparks, smoke or other dirt from the flue. This makes the machine suitable for indoor work, providing there is adequate ventilation. The minimum amount of air required for complete combustion is 2,470 cu. ft./hr.

Mains water is fed through a hose to an integral 10 gal. reservoir and detergent is mixed with the water in this prior to pumping. A simple control enables the operator to rinse down with wet steam only, leaving a clean surface for painting.

Overall weight is 350lb. and the equipment is mounted on three wheels for easy handling. **Magnus Chemical Co. Ltd., Industrial Estate, Uxbridge, Middlesex.**

Reader service reference No. 326

Telemetry system

Up to 24-channel multiplex transmission over long distances for electrical, chemical, steel and other industries is available with the Dur-O-Pulse industrial data transmission system.

Of the pulse duration type, the system uses either a 10 second or 5 second cycle time. It simultaneously carries process measurements and control signals up to 100 miles without repeater stations by use of microwave, radio or power line carrier networks, or over a single pair of wires.

Basically the equipment comprises a power pack, an indicator-transmitter and a recording receiver. Optional equipment includes flow integrators and microswitch or photocell alarm contacts. **Honeywell Controls Ltd., Greenford, Middlesex.**

Reader service reference No. 327

Oil burner

Called the Senior and designed for use with residual fuel oil having a viscosity of 200 secs. Redwood 1 at 100°F, this oil burner is the result of four years' development work and is specifically for use with air heating equipment.

The use of a sensitive thermostat having a differential of plus or minus 1°F and a new control sequence reduces fluctuations in oil temperature to 5°F. This feature enables the residual fuel oil, which must be preheated, to be successfully atomised by the pressure jet burner.

Provision is also made for the oil temperature to be further elevated during start-up and automatic compensation is made should this temperature fall too low during the hot oil circulation preceding a cold start.

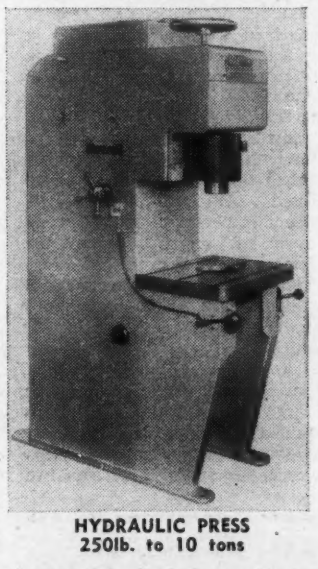
The burner control unit incorporates time delays and photo-resistor flame detection system for the complete control programme. The pre-heater is protected against overheating by a pressure relief valve and manual reset thermostat.

A 100-mesh strainer, which is easily removed for cleaning without dismantling or disturbing other components, is incorporated in the oil-way to the nozzle and all components subject to a normal working pressure of 200lb./sq. in. are pressure tested at 600lb./sq. in. **Wanson Co. Ltd., 7 Elstree Way, Borehamwood, Herts.**

Reader service reference No. 328

Hydraulic press

A development of the 7½ ton machine, this Norton 10 ton high speed automatic stroking press is a free-standing machine on which the controls have been streamlined and the power/stroking rate curve has been smoothed and flattened.



HYDRAULIC PRESS
250lb. to 10 tons

The stroke is steplessly variable and the dead stops allows setting to an accuracy of 0.0005in. The ram is fully guided and non-rotating and has a constant bearing area of 77 sq. in.

Tonnage setting is variable from 250lb. to 10 tons and the ram will return when its exertion reaches the preset pressure irrespective of whether it has reached the dead stop position.

Automatic stroking reaches a rate of 940 per minute at 1/16in. stroke length, and the rate is steplessly variable for any stroke length. **Frank Lewis & Co. (London) Ltd., 65 St. Paul's Churchyard, London, E.C.4.**

Reader service reference No. 329

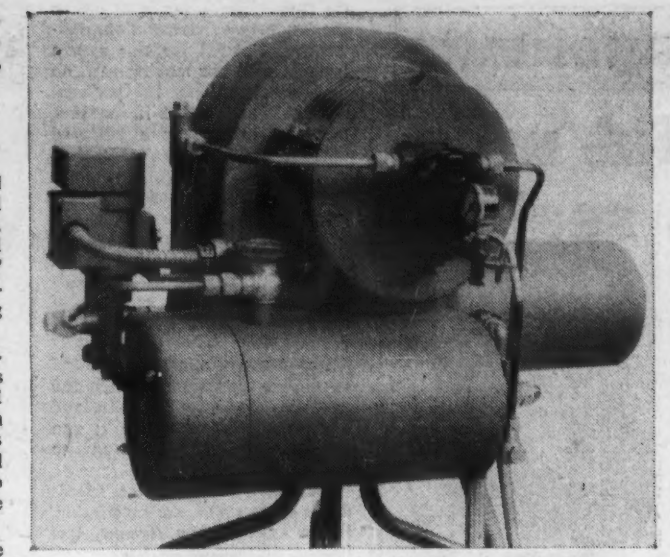
Electrical cubicles

These versatile standard housings for the electrical industry are intended to provide a basic shell in which control gear and other apparatus may be housed.

They are available in two basic types: with lockable side doors or with flat side panels. Each type is available in four heights and each height in four plan sizes, giving a total of thirty-two standard models.

Many optional variations and extras can be fitted without delaying delivery in any way. **Alfred Imhof Ltd., Ashley Works, Cowley Mill Road, Uxbridge, Middlesex.**

Reader service reference No. 330



OIL BURNER
Uses residual fuel oil

Standard buildings

The Johnson range of pre-engineered, packaged buildings for industrial, commercial and civic use are quickly erected and can be easily extended as required. Length or width can be adjusted to provide any required floor area.

Buildings can be supplied in any span, height and design up to 200ft. clear spans. Any form of cladding, lining and natural lighting can be provided and large sliding doors and windows can be fitted into various positions in the sides or end walls.

Either integral monorails or crane gantries of varying capacities are the subject of special design and in most cases can be mounted integrally with the structure to requirements. **Johnson Structures Ltd., Arnold Road, London, S.W.17.**

Reader service reference No. 331

Turbo tank

The Mann Egerton 11B Turbotank consists of a welded sheet steel case divided into two compartments. One houses the motorised pump and pipework and the other forms the cleaning compartment. In this a wire basket, divided into sections, rests on top of a turbine and cleaning fluid is pumped in, driving the turbine.

A rotary 4-jet spray unit can be positioned over the component basket if required and a hand spraying hose is also provided. A 3-way control enables the operator to select the method of spraying. **Mann Egerton & Co. Ltd., 5 Prince of Wales Road, Norwich.**

Reader service reference No. 332

Deepdrawing press

Belgian manufactured L.V.D. Deepdrawing presses are now available in the United Kingdom. One of these, the EMD150, is a double action double sided press. The bed, crown and two side frames are of rigid all-welded steel construction. The complete frame is normalised after welding and before machining. The slide faces of the guideways are covered with phosphor bronze.

Driven electro-hydraulically, the combined system permits semi or fully automatic operation. A special push button is provided for stopping the ram in any desired position. A braking device brakes the slide ¼in. before closing of the tools and overloading is impossible because a safety valve is provided which prevents the pre-set tonnage being exceeded.

Maximum pressure of the punch ram is 150 tons; blankholder 75 tons. Maximum stroke of punch ram is 23½in.; blankholder 11½in. **F. J. Edwards Ltd., 359-361 Euston Road, London, N.W.1.**

Reader service reference No. 333

Welding electrodes

Made from high-conductivity Mallory 3 alloy, this range of five spot-welding electrodes produced from ½in. diameter bar with ¼in. tapers to B.S.807, give better access in confined spaces and cost less than types made from ¼in. bar.

The tapers are accurately machined, the recommended tip diameter and rake angle are provided and the omission of spanner flats permits a larger diameter hole for cooling water. **Johnson Matthey & Co. Ltd., 73-83 Hatton Garden, London, E.C.1.**

Reader service reference No. 334

NEW Materials

Porous filter made of stainless steel

THIS porous stainless steel filter material is suitable as a base for fluidised beds and for distribution of fine gas bubbles in liquids. It may be used up to 600°C in air and in certain cases up to 850°C. The coefficient of expansion is 0.0000175 per degree centigrade over the range 20°C to 500°C.

Available in sheets up to 600mm. by 30mm. and in three standard thicknesses of 2mm., 3mm. and 5mm., there are eight grades of filtration covering the range from 3 microns to 75 microns.

Where the corrosive conditions are not oxidising and where stainless steel is otherwise unsuitable, the same range of elements is also available in Monel.

Initial production of these materials is being centred on flat sheet, discs and washers in standard sizes. Cylinders open at each end and capsules are produced by bending and welding flat sheets and are also available in standard sizes. **Bound Brook Bearings Ltd., Trent Valley Trading Estate, Lichfield, Staffs.**

Reader service reference No. 335

Heating tape

Intended for the heating of oils, waxes and chemicals in pipes as well as the vulcanising of cable joints, the Hotfoil electrical heating tape consists of six flat metal foil elements sandwiched between layers of glass fabrics, each element being encased in Melinex, a heat resisting plastic insulating material.

The elements give a heating surface ¾in. wide and are claimed to give a heat flow which is superior to thin wire elements. Current loadings already achieved are said to be as high again as those obtained by previous heating tapes. Since the tape is wound closely around the object being heated, the temperature difference between them at full heat is small. **The Midland Electric Installation Co. Ltd., Cyprus Works, Upper Villiers Street, Wolverhampton, Staffordshire.**

Reader service reference No. 336

Polypropylene

Of interest to organisations who contemplate a thermoplastic material for a component where the material must first be proved suitable, blocks of polypropylene are now available in sizes up to 12in. by 12in. by 1in., suitable for machining of prototypes.

This material has a low specific gravity, low water absorption, good abrasion resistance and a high temperature resistance. The most highly stabilised grades kept continuously at a temperature of 100°C have a life expectation of about three years. It is also resistant to most organic and inorganic chemicals even at relatively high temperatures. **Frederick W. Evans Ltd., Plastic Works, Long Acre, Birmingham 7.**

Reader service reference No. 337

Moulded insulation

Maximum efficiency at minimum weight, excellent handling properties, resilience and strength are the properties claimed for the new Fibreglass Superfine insulation. It is available in plain, film-faced, foil-faced and in many complicated moulded shapes.

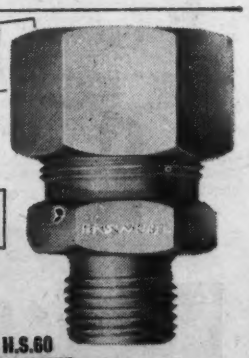
Moulded insulation makes for economical assembly and increased efficiency in such applications as silencer packings, heater unit insulation and sound-proofing panels.

Many densities and surfaces finishes are possible making the range of applications extremely wide. **Fibreglass Ltd., St. Helens, Lancs.**

Reader service reference No. 338

WHY [redacted] STABILO [redacted] ?
PAGE SEE 16

HYDRAULICS!
STEEL TUBE COUPLINGS
Catalogue H.S.60
DONALD BROWN (BROWNALL) LTD. STEEL DIVISION
ELLESMERE ST., OLDHAM ROAD, FAILSWORTH, Nr. MANCHESTER. Tel: FAI 2399 & 4615



NEW Components

Swivel joint uses p.t.f.e. seal

AVAILABLE in sizes from ¼in. to 2in. B.S.P.T., the Hilyn self-sealing swivel joint is suitable for ambient temperatures between minus 73°C and 232°C and although tested up to pressures of 2,500lb./sq. in., for usual industrial applications 500lb./sq. in. is the maximum recommended pressure.

The joint consists of five component parts: body, connector, nut, p.t.f.e. seal and spring. Four combinations of parts are available enabling a straight or elbow body to be used in conjunction with either a straight or elbow connection.

In use, the internal pressure acting on the base of the moving part provides the sealing force between the mushroom section and the p.t.f.e. seal. Additional support is provided by a spring which ensures a completely pressure-tight joint even at very low pressures.

Also available is the Hilyn rotary model swivel joint for applications involving continuous movement up to approximately 100 complete revolutions per minute and the Non-Flex swivel joint which prevents excessive side movement of the dog-leg assembly. **Hilyn Industrial Equipment Ltd., Hilyn Works, Lockfield Avenue, Brimsdown, Enfield, Middlesex.**

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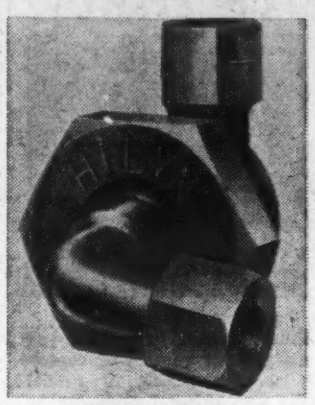
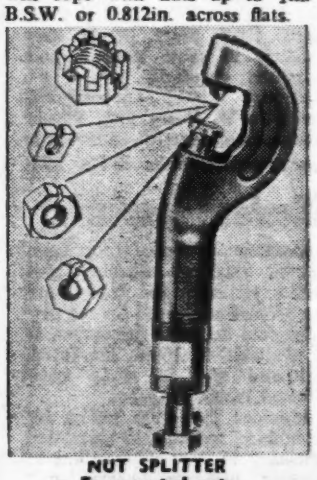


SWIVEL JOINT
Wide range

Nut splitter

Designed to "crack" tight and rusted nuts, this hydraulic splitter will cope with nuts up to ¼in. B.S.W. or 0.812in. across flats.



NUT SPLITTER
Frees rusted nuts

In use the chisel edge is set to grip the nut at right angles to the flat and a spanner is applied to apply the hydraulic pressure. The chisel is forced into the side of the nut and it splits free of the bolt or stud without causing damage to the threads. The tool is cranked to reach inaccessible parts and the hydraulic system enables great power to be exerted with the minimum of effort. **Pickavant & Co. Ltd., Bow Street, Birmingham.**

Reader service reference No. 340

Alternator

The Simms 1,750 watt 'bus alternator weighs 50lb., giving a typical installation weight saving over an equivalent d.c. machine of 40lb. and is 13in. overall in length, thus fitting a conventional 7in. swing mounting.

In the rectifier compartment, mounted on an arrangement of cooling fins, are the six power diodes which form the main rectifying 3-phase bridge, and three other diodes which serve to prevent reverse current to the field during shut-down and also provide a convenient means for connecting a warning light. All diodes are silicon and can operate at the higher temperatures met in built-in applications.

This machine is generally capable of supporting the whole of the lamp load at engine idle speed, depending upon the ratio chosen.

The basic machine is swing-mounted and hangs between 5in. bolts on 9in. centres but may also be obtained in cradle mounted form. **Simms Motor Units Ltd., East Finchley, London, N.2.**

Reader service reference No. 341

Bellows seals

The Sealol 605 consists of a welded metal bellows to which is attached a metal ring to hold the carbon seal ring. Depending how the seal is to be fixed to the shaft, the correct end fitting is welded to the last bellows convolution. Advantages claimed for this system include: only one moving part, no dynamic elastomers, 100 per cent all-metal construction if required, low cost and pressure balanced without any steps in the shaft or sleeve.

With standard packings, temperature from minus 100 degrees F. to plus 450 degrees F. can be accommodated and if desired, stainless steel or asbestos gaskets can be used giving a range of minus 350 degrees F to plus 800 degrees F.

For internal mounting the 605 is suitable for vacuum service and pressures up to 300lb./sq. in. and when mounted externally it can accommodate pressures up to 2001b./sq. in.

Depending on shaft size, speeds up to 4,500 r.p.m. are practicable. **Sealol Ltd., Willow Avenue, Uxbridge, Middlesex.**

Reader service reference No. 342

Sequence timer

The Magnacam timer is made in three forms: Type A for continuous operation as long as the motor is energised, Type B is self-resetting and is fitted with a hairspring to return the shaft to the start position when the motor is de-energised. Maximum cycle time is 6 minutes. Type C is self-resetting using a separate epicyclic clutch which gives instant resetting and allows cycle times up to a maximum of 1 week.

The switches are individually removable and each has three large integral screw terminals. Life tests of over 40 million operations have been completed without failure. Their action is single-pole changeover and the standard rating at 250 volts with a non-inductive, non-lamp load is 10 amps. This figure can be considerably increased at the expense of some reduction in life. For example they will switch a moderately inductive 15 amp load at 250 volts A.C. over 50,000 times.

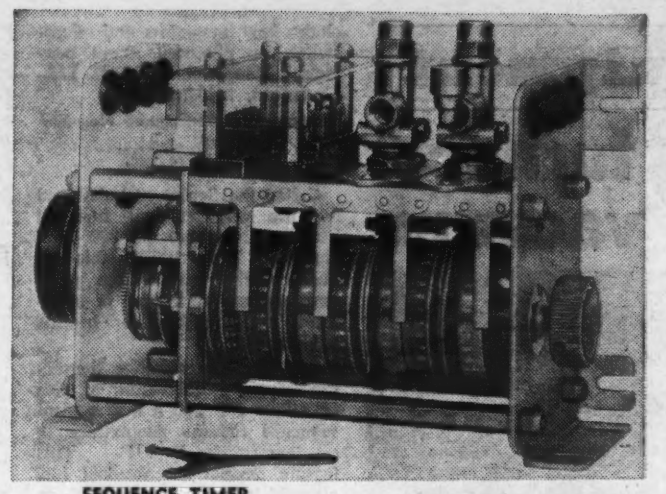
Any switch can be replaced with a 3-way pilot air valve for 1/8in. bore tubing. The range is 25 to 125lb./sq. in. and rating is 6cu. ft./min.

The cams are of the twin type giving separate adjustment at the on and off points. Up to 24 cams can be fitted, two parallel camshafts being used where more than 12 cams are required. The standard adjustable cams are single lobe and give one switching operation per revolution. Adjustable cams with up to 18 equally spaced lobes and non-adjustable asymmetrical cams can be supplied. **D. Robinson & Co. Ltd., 5 & 7 Church Road, Richmond, Surrey.**

Reader service reference No. 343

Flexible ducting

Thermaflex is a lightweight, flexible ducting built of tough, tear-resistant plastic-covered glass-fibre fabric that will not support combustion. It can be cut and connected on the job with the aid of adhesive, a penknife, tape and a pair of wire cutters.



SEQUENCE TIMER
Up to 24 cams

The main advantage of this material is its flexibility. It can be bent to half its own diameter with no loss in cross-sectional area.

Designed specifically for air conditioning and ventilation systems, it is available in a range of sizes from three in. to eight in. diameter in lengths of 12ft. **Flexible Ducting Ltd., Puchill Street, Maryhill, Glasgow, N.W.**

Reader service reference No. 344

Pressure seal

The Sealol range of shaft seals is of the mechanical or face type designed to provide an adequate seal on shafts with high pressure applications. The balanced pressure feature results from the use of the differential area principle which eliminates the need for high spring loading and allows close control of face pressures under all conditions of operation. This ensures minimum wear and long life even at very high rubbing speeds.

Operating pressures up to 1,000 lb./sq. in., rubbing speeds of 15,000ft./min. and temperatures up to 500 degrees F. can be coped with by the standard seal. Conditions in excess of these figures can be met by specially designed seals. **Sealol Ltd., Willow Avenue, Uxbridge, Middlesex.**

Reader service reference No. 345

Miniature relay

This general purpose relay has been introduced to satisfy the demand for a miniature relay having a larger number of contact springs than previously available. Spring-set combinations include four changeovers or six makes as well as the more normal arrangements using any number of contact springs up to twelve.

Relays can be supplied either voltage or current rated with an operating time of the order of 10 milliseconds.

Contact material can be gold alloy, silver, palladium or platinum. Preferred operating voltages are 6, 12, 24 and 48 volts. Coils are available from 0.25 ohms to 8,500 ohms resistance.

Also available is a plug-in version which may be used for either plug-in or wire-in applications. The moulded socket has 14 connection leaves which make direct contact with the tag ends of the relay springs and coil. A plastic dust cover holds both the relay and that portion of the socket which is proud of the mounting plate and is retained by a wire spring clip which is hinged under the socket. **Ericsson Telephones Ltd., Beeston, Nottingham.**

Reader service reference No. 346

Magnetic encoder

One of the simplest yet designed, this small dimension angle encoder with a Bu Ord Size 18 synchro mounting, provides non-ambiguous information in Gray code at 10,000 r.p.m.

Shaft drive permits either clockwise or anti-clockwise rotation for counting by the non-conducting magnetic unit, while output circuitry is available to customers' specification.

Designed to replace brush type encoders with which it is interchangeable, the equipment has the advantages of long life and high speed in operating conditions which are unsuitable for brush types. **Ketay Ltd., Eddes House, Eastern Avenue West, Romford, Essex.**

Reader service reference No. 347

NEW Publications

Generation of a low frequency supply for synchronous motors used in driving control rods in nuclear reactors is discussed in a leaflet entitled **Low Frequency Generators** by Bruce Peebles & Co. Ltd.

In this application, the supply must be capable of being varied and "frozen" at zero frequency when the motor is required to hold. An important requirement is purity of output waveform, particularly at or near the zero position as even slight steps can cause jerky rotation at a fraction of the sychronous speed.

Until recently, most schemes for low frequency generation have involved the use of comparative large rotating machines. This leaflet describes an essentially static scheme which has been under development for over two years.

Reader service reference No. 348

Intended primarily for students, a publication entitled **An Introduction to Low Alloy Constructional Steels** provides data on the influence of chemical composition on mechanical properties of low alloy constructional steels and shows how mechanical properties are affected by the microstructure of steel. The text gives indications of the important role played by various alloying elements which have to be considered when selecting steel to give particular properties.

Reader service reference No. 349

Accidents, a booklet published by H.M.S.O., priced at 1s. 3d., reports on 30 specific cases in factories, building, docks and engineering which were notified to H.M. Inspectors of Factories.

Each report describes the situation, how the accident occurred, the way in which the job should have been tackled and precautions that should have been taken to prevent the mishap.

Mention is made, where appropriate, of publications by the Factory Inspectorate, H.M.S.O. and British Standards Institution, dealing with precautions necessary in the industry concerned.

Reader service reference No. 350

The International Nickel Co. (Mond) has issued a booklet, **Nickel-containing Magnetic Materials,** which contains chapters on high permeability nickel-iron alloys, magnetostrictive materials, alloys with low curie points and permanent magnet alloys.

Each section covers early development, uses, further progress, and recent investigations and applications for the particular range of materials under review. Charts and graphs illustrate the physical and mechanical properties of the various alloys and specific information is given on the available forms.

The book also provides a comprehensive survey of the properties of nickel-containing magnetic materials in several appendices

Reader service reference No. 351

Silicate News, to be published quarterly, covers all developments in the silicates industry and each issue will spotlight one important or unusual use of silicates. The first edition deals with some 15 applications in many industries and, in nearly every case, reference is made to a source of further information.

Regular copies will be mailed on request to, The Editors, Link Information Services Ltd., Orchard House, Orchard Street, London, W.1

Reader service reference No. 352

A leaflet issued by I.C.I. deals with the fabrication of sandwich panels or laminates using polyurethane rigid foam. These panels consist of a rigid foam core bonded between various facing materials and are finding wide application in many fields where a combination of high strength to weight ratio and thermal insulation is required. This publication describes the equipment and the general techniques involved in the manufacture of such laminates

Reader service reference No. 353

READER ENQUIRY SERVICE

December 7, 1961

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WHY STABILO? SEE PAGE 16

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COMPACT-EFFICIENT-ECONOMICAL

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A complete Testing Unit to provide pressures up to 25,000 p.s.i. Operated by compressed air at 80-100 p.s.i. The unit can be preset to the required test pressure and will provide and maintain the pressure automatically and indefinitely without further attention.

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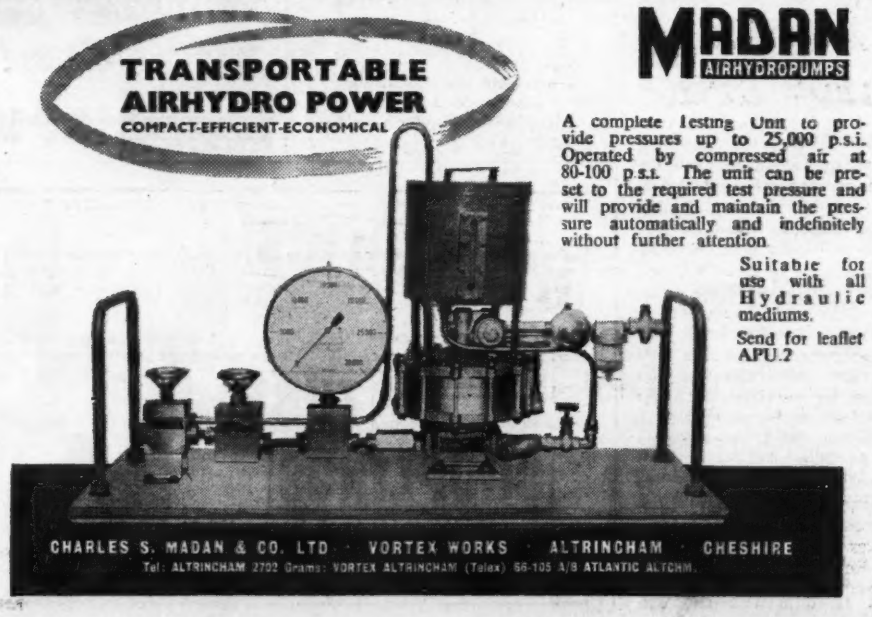

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ENGINEERING CONTRACTS

FURNACES FOR SHEFFIELD

GAS cleaning plant for electric arc, oxygen lanced furnaces to be built at English Steel Corporation steelworks has been ordered from the Gas Cleaning Division of W. C. Holmes and Co.

Each cleaning installation consists of a direct fume extraction system, a Holmes-Elex Electrical Precipitator and, for an 80-ton furnace to be installed at the River Don works, Sheffield, an effluent treatment plant.

The larger part of the £225,000 order concerns plant for two 100 ton furnaces which will be added to the new Tinsley Park works, Sheffield.

* * *

Pumping machinery for water works in the Wellesley Province of the Federation of Malaya is to be manufactured by Gwynnes Pumps, the London and Lincoln associate company of W. H. Allen Sons and Co., of Bedford.

The two pumps will be 12in. split casing, low lift pumps, driven by 80h.p., 960 r.p.m. slip-ring induction motors, and two split casing, high lift pumps, driven by 420h.p., 1,475 r.p.m. slipring induction motors, complete with their pipes, control gear, valves and cable work.

* * *

Further contracts placed with South Wales Switchgear, of Blackwood, Monmouthshire, (members of the Aberdare Holdings Group) for equipment to be installed at the West Thurrock Power Station brings the total of SWS gear to be installed at West Thurrock to some £500,000.

At present making low voltage auxiliary switchboards for this station, the company is now to make 35 similar switchboards for auxiliaries on the third, fourth and fifth generator sets.

Fast pumping

Pumps to be built for the new Clyde Dry Dock by Drysdale and Co., of Glasgow will be capable of emptying the dock of 40 million gallons of water in two and a half hours.

Three electrically driven axial flow pumps of 60in. bore will have a combined pumping capacity of 255,000 gallons of water a minute.

A large ship in the dock may reduce the emptying time to one and a half hours. In an emergency two of the pumps can work in reverse to cut down the normal filling time of one and a half hours. Drysdale are a G. & J. Weir company.

* * *

A 60 MW turbine generator with condensing plant, de-aerator and auxiliaries has been ordered from Associated Electrical Industries for the Hok-Un power station in Hong Kong.

Eight turbine generators supplied by AEI are installed and working in the station, ranging in output from 12.5 MW to 30 MW. The new generator will have steam conditions of 915 psi, 900 degrees F.

Free-forge press

Loewy Engineering, of Bournemouth, are to supply to a French customer a 1,200 ton oil-hydraulic free-forging press, valued at more than £100,000.

The press has high speed capabilities working to very accurate limits. It is equipped with electronic thickness control and will be integrated with a rail-bound manipulator.

Five free-forging installations, varying in capacity from 600 to 4,000 tons are currently on order with the Loewy company, a subsidiary of Tube Investments.

A large quantity of refractory materials for export to New Zealand by Generator Refractories, Sheffield, is being despatched from works in the Genefax group.

The mv Holmdale, which left on her maiden voyage on the first of this month, carried 850 tons of refractories for the largest plant of its kind in New Zealand.

Extension switchboards and units for use with switchgear previously supplied to Kuwait are to be provided by J. G. Statter and Co., of Amersham, Bucks, members of the Metal Industries Group.

PACIFIC CABLE SPEED-UP

A VIGOROUS Commonwealth-embracing effort is going into the rapid progress being made in establishing the new Pacific Ocean cable to connect Canada, Australia, and New Zealand.

UK firms have won orders for 8,700 nautical miles of submarine telephone cable with 335 submarine repeaters. Much of the raw materials are coming from Australia and Canada. Cable and Wireless have ordered a new vessel to assist in cable laying.

First section

First section of the cable to be laid and made ready to go into service will be the Sydney-Auckland section.

In the swiftly developing field of satellite communication systems the Commonwealth telecommunication administrations are keeping up a close watch and pooling information, says the tenth annual general report of the Commonwealth Telecommunications Board.

Growth in traffic on the Commonwealth telecommunication system in 1960, compared with 1959, was: Telephone traffic, up 14 per cent; Telex traffic, up 27 per cent; Telegraph traffic, up by 4.1 per cent.

FINANCE AND COMMERCE

COSTS THREATEN INDUSTRY

Coal, road haulage, and labour are likely to rise soon

A SERIOUS round of new pressures on costs now threatens to be inflicted on industry early in the New Year. Industrial prices of large coal and road haulage rates have both been the subject of statements on proposed increases. Important wage claims are pending for some 6 million workers, 3¼ million of them in engineering and shipbuilding employment.

The increase in road haulage rates is to be 7½ per cent and takes effect on New Year's Day.

On the same day standard rates of pay in the road haulage concerns go up by three per cent, the working week comes down to 42 hours, and real earnings rise by about 10 per cent.

The Road Haulage Association (17,000 members) and the National Conference of Road Transport Clearing Houses (whose members operate 8,000 long distance goods vehicles) have both recommended the 7½ per cent increase.

£14m. a year extra

Price rises in certain industrial coals, which are to be put before the Industrial Coal Consumers' Council, will bring in another £14 million a year to the National Coal Board on its present sales.

For industrial users of large coal in all areas the price will rise by 10s. a ton. In Scotland all industrial coal is going up by 10s. a ton.

In Lancashire and North Wales all industrial coal goes up by 6s. a ton.

Some ten million tons of the coal concerned is taken by iron and steel (already considerably affected by price rises), by brickmaking and by the railways.

Wage claims

In addition to the engineers and shipbuilders (who are understood to be seeking another £1 a week and two hours of the working week), 300,000 day-wage mineworkers are asking for another £1 a week and 1½ hours off the working week.

TRADE AGREEMENTS

ANGLO-U.S. COMPANY FORMED

DEUTSCH connectors for electrical conductors and other products, and connectors and ancillary equipment now being made by Hellermann, will be manufactured and marketed by a new subsidiary company—Hellermann Deutsch—formed by Bowthorpe Holdings, of Crawley, Sussex, and the Deutsch Company, of Banning, California.

A new factory for Hellermann Deutsch is due to be completed next year at East Grinstead, Sussex. Production of Deutsch connectors is to start early next year.

* * *

The cash offer by Clifford Motor Components of 8s. 6d. a share for the whole issued Ordinary share capital of Specialloid, is announced by Philip Hill, Higginson, Erlangers, as having been accepted by the holders of more than 95 per cent of the Ordinary shares. The offer has accordingly been made unconditional.

Industrial agents

Oliver Rix, the East Anglian agricultural engineers, have been appointed distributors of Massey-Ferguson industrial equipment in Norfolk and Suffolk.

* * *

Siemens and Halske AG, Munich, Germany, who are among the largest electronic equipment makers in the world, have taken an interest of more than 25 per cent in the US Instrument Corporation, Charlottesville, Virginia.

A large manufacturer of telecommunications equipment, the US company is the sole American licensee for the import and production of Siemens and Halske telephone equipment.

OIL PLANT ORDERS DECLINE

OIL company orders for materials and equipment were worth £23.8 million in the third quarter of this year, bringing the total of the first nine months to £76.1 million.

This is some £14 million down on the equivalent figures for last year, when orders were running higher than for several years.

Bulk chemicals formed the largest item in the January - September period, reaching £19.2 million. Gear and equipment in the category "tubulars, pipe fittings, and valves" was worth £6.9 million; specialised oil refinery equipment £6.6 million; tools and machinery £4.7 million; and automotive equipment £4.4 million.

Supply by the U.K. oil equipment producing companies now includes geophysical apparatus, derricks, hoists, slush pumps, drill collars, oil casing and other equipment.

This is an indication of the progress made since the days before the Second World War when almost all specialised equipment of this kind was bought from U.S. companies.

The annual total of oil equipment bought in the U.K. (excluding gear ordered by foreign oil concerns) looks like just exceeding £100 million, the seventh year running in which the £100 million mark has been passed.

GAUGES FIRM CHANGE NAME

THE gauging divisions of Teddington Industrial Equipment have been transferred as a unit to Teddington Aircraft Controls.

The company explains that the change has been made to give increased manufacturing, development and design facilities to meet increasing demand for their "Teddington" air gauges.

Exports up in office equipment

OCTOBER'S exports of office equipment were the second highest at £3,457,716 since records have been kept. The Business Equipment Trade Association reports that the peak was the £3,534,842 reached in March of this year.

Increasing sales of accounting machines, duplicators, miscellaneous equipment and parts all showed a marked improvement in recent months.

Typewriter sales, both portable and standard models, were down on the figures for October, 1960.

The chief customers were France, Australia, the U.S., Japan, and Western Germany. Exports to the states of the European Free Trade Association were £211,823 (£162,795 in October, 1960) and to the European Common Market they were £627,784 (£471,950).

America's PB 250 for Britain

A PACKARD-BELL PB 250 computer, produced in Los Angeles, U.S.A., is shortly to be delivered to the Royal Aircraft Establishment, Farnborough.

The unit was sold and is to be installed by the U.S. company's U.K. agents, Benson-Lehner (G.B.) of Southampton.

Low cost

This machine operates in some numbers in the U.S., but this is its first installation in Britain. A general purpose digital machine, the PB 250 has a special characteristic of combining high speed in operation with small size and low cost.

Suitability for process control work in addition to scientific applications has been achieved by maintaining a high degree of compatibility with a variety of peripheral equipment.

Export opportunities

AUSTRALIA: Bogie Parts. 100 wagon sets cast steel freight bogie parts comprising side frames, bolsters, brake beams, and bolster control device parts. Bids should be sent to the Secretary, Victorian Railways, Melbourne C.1, quoting Contract No. 62,126. Copy of tender and specifications only in Export Services Branch. Closing date December 13, 1961. ESB 36078/61.

EGYPT: Rotary Wharf Cranes. Suez Canal Authority is inviting tenders for the supply and installation of three rotary wharf cranes on rails, according to conditions and specifications obtainable from the Authority at Ismailia. Tenders should reach the Procurement Department at Ismailia not later than January 15, 1962. ESB 35783/61.

IRAN: Three centrifugal pumps for diffuser sugar juice, capacity 60 cubic metres per hour, total head 50 metres, speed 1,450 rpm, complete with 220-380 v electric motor. Bids should be sent to the Iran Sugar Corporation, Avenue Villa, Khoshbin, Teheran. Closing date December 30, 1961. ESB 36075/61.

PORTUGESE EAST AFRICA: One radial drilling machine with baseplate. Specifications are obtainable from the Railway Warehouse at Lourenco Marques through local agents. Bids should be sent to the Ports, Railways and Transport Department, Lourenco Marques. Closing date February 5, 1962.

TURKEY: Vehicles. The Cement Industry Corporation of Turkey has called for tenders for 17 ten ton load capacity lorries with dumping arrangement. Bids should be sent to Turkiye Cimento Sanayii T.A.S., Genel Murdurlugu, Kavaklidere, Ankara. Closing date December 18, 1961. ESB 36621/61.

PANAMA: Refrigerating Equipment. The Panama Railroad Company has made a call for tenders through their New Orleans office for the supply of refrigerating equipment for two refrigeration rail cars. Specifications can be obtained from the New Orleans office. Closing date January 27, 1962. ESB 36394/61.

AUSTRALIA: Cable Installation. Design, manufacture, testing at works, supply and delivery to site of 132 kV power cables and all accessories and of pilot cables and all accessories in accordance with specifications.

Bids should be sent to the Manager and Secretary, Electricity Commission of New South Wales, Box 5257, GPO, Sydney, NSW, quoting Specification No. 1194. Closing date February 26, 1962. ESB 36669/61.

Inquiries should go to the Export Services Branch, Board of Trade, Lacon House, Theobalds Road, W.C.1, before dates given. References (ESB) should be quoted.

Export help for the small firm

A SCHEME for assisting primarily small and medium firms in exporting to West Germany has been launched by bankers, William Brandt's Sons and Co.

The bank is to offer full payment in cash against documents on the delivery of goods to a British port.

The plan may also aid companies now exporting to West Germany by providing a factoring service and by making available, in approved cases, certain credit facilities.

A spokesman for the bank told Engineering News that it is intended also to provide market assessments for particular product lines. Reliable agents can also be selected in West Germany with the help of Brandt's.

RADYNE

IMPROVED METHODS OF INDUCTION HEATING

A line of R.F. induction heaters in service with the Ford Motor Company, Basildon, Essex.

Many high production processes are best carried out by radio frequency heating . . . best because of its inherent controllability; best for blunt indisputable facts of economics.

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In forging, stamping and other processes, rapid through heating to forging temperature saves time and space, reduces scaling and in consequence wear and tear on dies, improves dimensional accuracy and gives better working conditions.

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P.7038

FINANCE AND COMMERCE

ENGINEERING OUTPUT RISES

FIRST OF THE STEEL DIVIDENDS

THOMAS FIRTH and John Brown, the first of the steel firms to declare the dividend, made a profit for the year up to September 30 only one per cent less than in 1960.

The comparable figures were £2,361,921 (1961) against £2,386,331.

Firth and John Brown owe at least some of their buoyancy at a time when the steel industry is working to about three quarters of capacity, to producing much of the country's special, mainly stainless, steels. Alloy steel output rose five per cent in the first half of the year.

BoT's index of export orders at record level

OUTPUT from the engineering and electrical goods industries was rising sharply in September and the volume of new orders flowing in was up by five per cent over September, 1960.

The Board of Trade's index of export orders on hand in engineering rose in September to 111, a new record level, which is nine points above the figure at which the index stood a year ago.

The rate of new export orders, which were four per cent above those of the previous September, has not been keeping pace with the rise in orders on hand, a reflection of growing lengths of delivery dates in some parts of industry.

Six points

The index for net new orders recovered from August's low level of 95 to 126 for September, which was six points above the figure for September last year but still a long way short of the peak of 136 achieved in July this year.

Taking the three months of the third quarter together, the Board of Trade states that new home market orders were down on the same quarter of 1960 by two per cent, while new export orders were up by three per cent.

The falling demand from the home market brought about a position where, despite the position in export orders, there was no general change in the orders on hand situation.

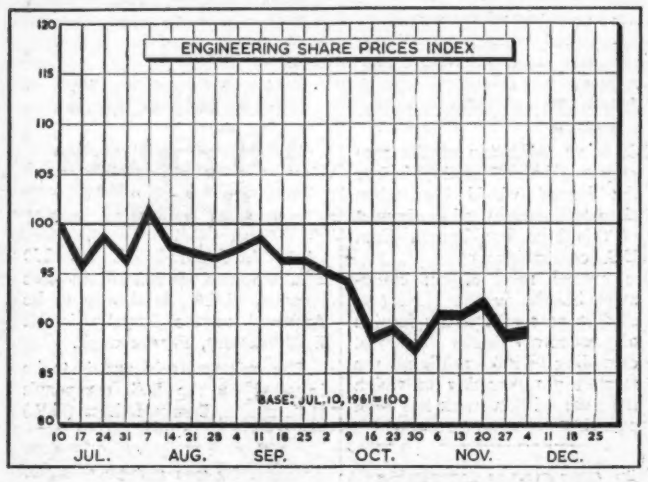
Rise in plastics

The producers of plastics materials also improved their export performance in the third quarter of the year over the equivalent period of last year.

While doing better on the yearly comparison, direct plastics materials exports were less in the third quarter than in the first and second of the year.

Net sales of all plastics materials made in the UK in the third quarter were 145,600 tons, 13 per cent above the level of a year earlier.

Thermoplastic materials did better by 19 per cent, thermosetting materials by 4 per cent. Increased consumption accounted for much of the growing sales figures. Manufacturers stocks rose slightly during the quarter and finished 11 per cent above the level of twelve months earlier.



MORE SPENT ON BUILDING

CONSTRUCTIONAL work for industry remained at a high level in the third quarter of the year. The work carried out by contractors in industrial development was valued by the Ministry of Works at £104 million. The comparable figure in 1960 had been £89 million.

U.K. electrical sales to EEC up by 45 p.c.

A SPECTACULAR rise by 45 per cent in British electrical and allied engineering exports to the countries of the Common Market took place in the first nine months of the year. To all the world markets U.K. exports in this category increased by 10 per cent.

Giving these figures in London last week, Mr. Leonard H. Short, chairman of the export panel of the British Electrical and Allied Manufacturers' Association, said that the industry had plans to boost these efforts still further next year. Competition in all export fields was increasingly intense.

Exports from the electrical and allied engineering section brought in £238 million up to the end of September, £22 million better than in the first nine months of 1960.

Good improvement

This 10 per cent improvement compares with four per cent rise in British total exports. It is also a fifth of the overall improvement of £99 million in the export performance in the first three quarters.

Among the industry's plans for stepping up its export performance will be the domestic appliance makers participation at the International Household Goods and Hardware Fair at Cologne, next February.

Further afield, BEAMA and the Board of Trade are to co-operate in exhibiting next year at the International Trade Fair, in Lagos, Nigeria, which will take place alongside a conference on the long distance transmission of electricity.

TRADE SHOW HELP

A SUBSIDIARY company, Olympia Exhibitions Ltd., has been formed by Olympia Ltd. to provide services to British manufacturers who wish to participate in exhibitions in Europe and elsewhere.

Production capacity for stand building and other exhibition needs will be substantially increased in the new organisation.

The wage pause causes stock market indecision

WEEK IN THE CITY
BY OUR CITY EDITOR

WITH the future of the pay pause still in doubt and several other economic problems unresolved, stock markets are now in a period of indecision. Trading volume has been modest, though prices generally have remained firm.

The reluctance of the average investor to part with what he considers to be good stocks is still helping to sustain the industrial sections, despite continued evidence of pressure on profit margins.

The basic attraction of Ordinary shares as a hedge against inflation has not been entirely dimmed.

It seems likely, however, that this anti-inflation element will be a less potent factor in the 1960s than it was in the '50s. Previous rates of growth will be more difficult to sustain and manufacturers will also find it harder to absorb increased costs in higher selling prices.

Among the market features of the past week or two has been an increase in the number of takeover bids and a revival in demand for gold shares.

Foreign exchange

The demand for "Kaffirs", as they are called, stems partly from hopes of a relaxation of monetary controls in South Africa and also from the possibility, however remote, of a depreciation of leading currencies in terms of gold.

Sterling weakened in the foreign exchange market at the end of last week, though this appears to have been due largely to a misunderstanding of some remarks made, or reported to have been made, by Mr. Selwyn Lloyd to leaders of the T.U.C. about currency prospects. From the standpoint of Government policy, devaluation is still "not on".

Among the features of engineering company news has been a good set of results from Birfield. The year to July 31 last saw an 11 per cent increse in sales and a 28 per cent increase in pre-tax profits. The dividend for the year is to be 10 per cent, as forecast.

Profits are understood to be a little lower in the current year, reflecting troubles in the motor industry, but the chairman is optimistic about long-term prospects, and thinks the group would benefit greatly from Britain's entry into the Common Market. Birfield shares currently yield about 3 per cent on the dividend and nearly 18 per cent on earning.

Dividend maintained

Elsewhere, interest has been aroused by a tussle between Morgan Crucible and S. Smith and Sons for control of Lodge Plugs and by the start of the steel dividend season, with Thos. Firth and John Brown paying a maintained 12½ per cent dividend out of slightly better net profits. Pre-tax profits were marginally lower at £4,425,000, but there has also been a fall in the tax charge.

Good results have also been produced by United Wire Works. The company is raising its tax-free dividend from 20 to 22 per cent, profits before tax having increased from £840,000 to £993,000.

£170,000 PLANT FOR EGYPT

The Bradley Pulverizer Co., are to carry out a £170,000 contract for increasing the capacity of superphosphate manufacture at Kafr-el-Zayat, Egypt. The contract was placed by the Societe Financiere et Industrielle d'Egypte.

This extension will absorb the output of a new sulphuric acid plant being installed by Simon-Carves. Consulting engineers to the Societe are Cremer and Warner, Westminster.

U.K. MACHINE TOOL DELIVERIES RISE

DELIVERIES from the U.K. machine tool manufacturers continue to increase. New home orders were still declining in September. Similarly, export orders, which came in strongly from May to August, fell fairly sharply, a trend which the MTTA believes to have carried on in October.

Home deliveries have risen from £6,466,000 in September, 1960 to £7,263,000 this September. In the same months net new home orders have fallen from £7,692,000 to £7,246,000.

Export deliveries have gone from £2,255,000 in September, 1960 to £2,686,000. Export orders moved downwards from £2,891,000 to £2,715,000.

The industry's total order book is estimated to be standing at about £118 million at the end of September.

From the start of the year the value of home orders on hand has risen by 7 per cent and export orders by 31 per cent.

Not all companies conform to these overall trends. Some companies, with machines of highly-specialised application have had their delivery dates lengthened by the swift increase in export orders of earlier this year.

Other manufacturers, with a more general range of machines, are taking orders now at much the same pace as before.

NEW Companies

Forsite Engineering Cl Ltd., 34 Whitehorse Street, Boldock, Herts. To carry on the business of manufacturers and dealers in engineering machinery, machine tools, etc. Nominal capital £100.

R. F. Gardiner Ltd., 19 High Street, Great Bookham, Surrey. To carry on the business of tool, pattern and machinery designers and general engineers, etc. Nominal capital £100.

Glass Tubes and Components Ltd. To take over part of the undertakings of AEI Lamp and Lighting Co. Ltd. and General Electric Company Ltd. Nominal capital £2,500,000 in £1 shares (600,000 "A" Ordinary, 600,000 "B" Ordinary and 1,300,000 "C" Ordinary).

These particulars are selected from the daily Jordan's Register, published by Jordan & Sons Ltd., 116 Chancery Lane, London, W.C.2.

ENGINEERING NEWS SHARE PRICES TABLE

1961 High	1961 Low	Stock	Dec. 4	Ch'ge	Y'ld p.c.	1961 High	1961 Low	Stock	Dec. 4	Ch'ge	Y'ld p.c.
47/9	30/9	Allen, Edgar (£1)	3/-	–3d.	8.6	57/-	44/9	Lister, R.A. (£1)	54/6	...	5.9
43/-	24/9	Allen, W. H. (£1)	24/9	...	7.9	51/9	36/-	Mather & Platt (£1)	37/3	...	5.8
77/-	58/6	Angus, George (£1)	67/6	...	5.9	67/-	46/-	Metal Industries (£1)	53/6	+6d.	5.5
31/10½	19/-	A.P.V. (10/)	31/-	...	3.5	71/3	53/4½	Morgan Crucible (£1)	59/3	...	4.6
14/1½	8/10½	Asquith Machine Tool (5/)	10/-	–3d.	2.4	31/-	16/9	Morris, Herbert (10/)	17/-	+3d.	8.1
48/6	29/-	Assoc. Electrical Ind. (£1)	30/3	–1/3	9.8	52/-	37/3	Murex (£1)	40/6	+1/-	6.3
16/5	11/8	Assoc. Engineering (5/)	13/9	...	4.8	49/6	40/6	Neepsend Steel (5/)	41/3	...	5.9
110/-	83/-	Averys (£1)	94/9	+4/9	3.1	31/6	20/6	Newton Chambers (5/)	22/-	–6d.	4.4
36/9	20/-	Babcock & Wilcox (£1)	21/6	–6d.	...	41/3	20/7½	Parkinson Cowan (£1)	21/3	...	8.2
59/6	40/6	Baker Perkins (£1)	45/-	–3d.	4.9	72/9	47/-	Parsons, C. A. (£1)	52/6	...	4.7
9/7½	5/10½d.	Beyer Peacock (5/)	7/3	–1½d.	8.0	40/3	38/-	Plessey (10/)	46/-	+2/3	3.2
77/-	45/-	Birfield (£1)	65/3	+3/4½	3.0	33/-	16/-	Pressed Steel (5/)	17/6	+9d.	...
102/10½	64/6	Birmid Industries (£1,	64/6	–3d.	6.1	25/3	19/9	Qualcast (5/)	21/3	+1½d.	4.2
36/10½	18/10½	Birmingham Small Arms (10/)	18/10½	...	6.1	38/1½	22/3	Radiation (£1)	24/6	–9d.	8.0
45/6	33/6	Brockhouse, James (£1)	41/-	+3/-	6.0	22/6	14/-	Ransome & Marles (5/)	15/3	...	4.4
28/9	22/-	Broom & Wade (5/)	22/3	+3d.	5.0	28/6	22/6	Ransomes, Sims & Jeffs (£1)	24/6	...	6.1
42/6	29/9	Brotherhood, Peter (10/)	31/9	...	7.7	50/6	34/6	Renold Chains (£1)	45/-	+1/3	4.5
48/9	30/4½	Brown, John (£1)	32/3	+1/1½	6.7	52/3	38/-	Reyrolle, A. (£1)	42/6	+6d.	4.5
8/6	4/3	Cammell Laird (5/)	4/3	–3d.	...	9/1½	3/4½	Richardsons Westgarth (10/)	3/10½	...	...
39/6	24/9	Carrier Engineering (5/)	24/9	–1/6	4.9	9/3	4/3	Roberts, Charles (5/)	4/3	–3d.	...
54/3	36/3	Clarke Chapman (£1)	36/3	–1/-	7.4	48/6	36/7½	Rolls-Royce (£1)	36/7½	–7½d.	6.0
14/9	9/6	Cohen, George (5/)	9/9	+3d.	6.3	32/6	20/-	Ruston & Hornsby (£1)	20/3	+3d.	8.6
33/10½	21/8	Coventry Gauge & Tool (10/)	32/6	+2/10½	3.7	19/3	12/3	Serck (5/)	12/6	+3d.	4.9
12/3	7/3	Craven Brothers (5/)	8/4½	–1½d.	5.0	23/9	12/4½	Shaw, Francis (4/)	12/7½	...	6.1
24/-	17/6	Crofts Engineers (5/)	21/3	...	3.9	12/-	7/9	Sheepbridge Engrg. (5/)	8/6	+3d.	8.3
39/7½	30/-	Davy-Ashmore (5/)	30/10½	+4½d.	4.3	32/4½	19/1½	Simms Motor (5/)	24/3	+9d.	3.5
70/-	44/3	De La Rue (10/)	54/-	+1/-	4.1	44/1½	29/7½	Simon Engineering (5/)	32/-	–3d.	4.2
27/7½	19/9	Delta Metal (5/)	20/6	+3d.	4.8	23/9	13/9	Smith, S. & Sons (4/)	15/9	+6d.	5.0
68/9	50/-	Desoutter (5/)	60/-	+1/3	2.8	15/3	11/-	Solar Industries (5/)	11/3	+1½d.	7.7
41/3	29/6	Dowty Group (10/)	29/6	–10½d.	4.9	45/7½	22/6	Staveley Industries (£1)	22/6	–6d.	9.6
32/10½	22/4½	Edwards High Vacuum (4/)	31/7½	–1½d.	1.9	32/6	18/6	Steel & Co. (5/)	30/10½	–6d.	3.6
52/-	35/3	Elec. & Musical Ind. (10/)	43/9	+1/-	3.9	67/-	38/-	Stone-Platt Ind. (£1)	42/-	+3/6	...
38/-	25/9	Elliott-Automation (5/)	40/1½	+1/1½	1.6	20/4½	14/-	Tecalemit (5/)	16/6	+6d.	5.4
40/6	25/3	English Electric (£1)	25/3	–1/9	7.8	17/4½	11/-	Thompson, John (5/)	11/-	–6d.	2.2
37/3	22/9	Firth Cleveland (4/)	22/9	–3d.	5.6	7/-	4/-	Thornycroft, John (4/)	4/-	–3d.	8.6
39/6	24/3	G.E.C. (£1)	25/-	–1/-	8.1	17/6	11/6	Toledo Woodhead (4/)	15/-	+1/4½	5.2
65/-	47/3	General Refractories (10/)	47/9	+6d.	5.1	85/6	55/-	Tube Investments (£1)	63/-	+1/6	4.4
66/6	46/3	Glenfield & Kennedy (£1)	46/3	–1/3	...	38/4½	25/6	Vickers (£1)	25/6	...	7.7
108/7½	72/6	Guest, Keen & Nettlefold (£1)	74/-	+1/6	4.2	157/6	122/6	Walmsley (Bury) (£1)	132/6	...	3.3
48/7½	26/6	Haden, G. N. (5/)	32/-	–6d.	3.0	84/6	63/-	Ward, Thos. W. (£1)	63/-	–1/6	4.3
16/6	12/1½	Hall-Thermotank (5/)	12/6	+1½d.	4.4	17/9	10/1½	Weir, G. & J. (5/)	11/3	...	7.8
24/-	13/4½	Harland & Wolff (£1)	13/4½	...	7.2	47/6	27/6	Wellman Smith Owen (5/)	28/6	+1/-	3.8
33/3	21/6	Hawker Siddeley (£1)	21/6	...	9.7	14/1½	9/10½	West, Allen (5/-)	9/10½	–1½d.	6.7
31/-	19/9	Head Wrightson (5/)	20/3	–1/-	3.8	46/3	23/9	Westinghouse Brake (£1)	23/9	–1/-	9.1
79/9	51/6	Herbert, Alfred (£1)	63/9	...	4.3	36/6	18/-	Whessoe (5/)	18/-	–6d.	7.4
95/6	70/-	Hick Hargreaves (£1)	70/-	...	5.8	17/-	12/-	Wilmot-Breeden (5/)	14/6	...	3.8
138/9	101/3	Hopkinsons (£1)	110/7½	+3/1½	4.9	30/-	19/6	Woodall-Duckham (5/)	19/6	–3d.	5.3
25/-	18/6	Howden, James (5/)	20/-	–6d.	6.1	64/9	44/6	Worthington-Simpson (10/)	48/6	...	5.1
33/9	22/7½	International Combus (5/)	25/9	...	5.7						
IRON AND STEEL											
43/6	25/7½	Brown Bayley (10/)	36/9	+1/-	4.3	42/-	22/7½	South Durham Steel (£1)	25/3	+2/-	9.4
81/3	49/-	Colvilles (£1)	50/10½	+1/-	6.2	47/8¼d.	30/7½	Steel Co. of Wales (£1)	31/1½	+6d.	7.9
32/3	21/1½	Consett Iron (£1)	21/1½	...	8.8	57/4½	36/7½	Stewarts & Lloyds (£1)	38/7½	+2/-	7.7
43/7½	23/10½	Dorman Long (£1)	24/7½	+9d.	8.0	68/7½	42/1½	John Summers (£1)	44/1½	+1/3	6.7
55/1½	37/-	Firth & Brown (£1)	41/6	+4/6	6.1	55/7½	38/-	United Steel Cos. (£1)	41/7½	+2/3	5.8
49/10½	31/1½	Lancashire Steel (£1)	32/7½	+10½d.	6.6	63/6	46/-	Whitehead Iron & Steel (£1)	47/-	–6d.	6.2

The companies whose share prices are quoted in the Engineering table and which form the basis of the Index give a balanced and comprehensive study of the engineering industry. Prices quoted are those at the start of the week. Due adjustments for Rights and Scrip issues are made. The Index figure is calculated on a National Cash Register Company computer. Prices in the Iron and Steel sections are not included in the Index.

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DO WOMEN MAKE GOOD ENGINEERS?

by
D. W. HUTCHINGS
Oxford University, department of Education

IN his essay on **Two Cultures**, C. P. Snow has pointed out that we in Britain cut our scientific potential in half.

He was, of course, referring to the comparatively few women in this country who become scientists and technologists.

Nor do annual statistics prepared by the Ministry of Education give any grounds for optimism, for while it is true that some women become scientists and even engineers, on the whole society has set its face against it.

It is significant that only half as many girls take science subjects in the sixth-forms of grammar schools as boys, most of them taking biological science.

Women may become teachers, lawyers or doctors. Women scientists may be tolerated but women engineers — really that's taking things too far!

How different is the position in the USSR where more than one-third of the professional engineers are women. Even more startling — one-tenth of top - management and other senior posts in technology are occupied by women!

In the middle 1930s the entry of girls into engineering institutes in the USSR increased gradually at first and then more rapidly so that by the end of the decade the 30 per cent mark was passed.

During this period, the feeling of conservatism on the part of managers, older engineers, and other workers had largely disappeared. Also the younger men who had grown up in co - educational schools were sharing engineering classes with girls and were taught by staffs which, for example, in 1939 included 23 per cent women.

It was not surprising that it became taken for granted that engineering was not only a possible, but a suitable profession for women.

A study of **Women Engineers in the USSR**, carried out under the auspices of the Caroline Haslett Memorial Trust, makes it abundantly clear that there is nothing incongruous about women becoming good engineers, and in the light of this report, time - honoured arguments against women entering the professions, particularly to engineering, seem out-dated:

It is not worth training a woman because if she gets married or or has a family she will be lost to industry.

Women have different interests and abilities from men — they are not physically strong enough for some kinds of work.

Men don't like taking orders from women — in fact, even women prefer to have men bosses.

A woman's place is in the home — mothers who work are the cause of much juvenile delinquency.

The report does not argue against these criticisms. Instead it states facts which compel even the most prejudiced reader to think again.

The attitude in the USSR to engineers who are married is similar to that in this country towards a woman doctor or lawyer.

Special leave

Moreover, industry has been geared to allow for maternity leave. The normal arrangement is for an engineer of similar qualifications and background to deputise for a mother-to-be. If the expectant-mother is a key engineer, she will discuss the programme of work with her deputy.

After the beginning of the leave, she may visit the plant or is visited in her own home for discussion of the work by members of the team.

In spite of this inconvenience, the event is welcomed and visits to the plant are marked with gifts and flowers.

As might be expected, women tend to show different work-preferences to men. Generally speaking, women prefer engineering design and laboratory research work and leave the running of power stations to men.

Engineering economics is particularly popular with girls; indeed, until recently, girls made up to 95 per cent of that faculty in the Leningrad Polytechnic and it has been nicknamed the "girls' faculty."

Throughout the USSR, women are forbidden to take up any branch of engineering considered prejudicial to health. Thus while girls are allowed to study mining engineering and to practise professionally in surface jobs they are forbidden to work underground.

Quite apart from the legal aspect, women engineers are discouraged from taking up jobs considered to be unsuitable or unpleasant, such as heavy metallurgical engineering and some processes of chemical engineering. Even so, every year women apply for posts considered to be either "forbidden" or "unsuitable."

It is certain that some men in Russia, as in this country, dislike working for women but the evidence shows that this conservative attitude is soon overcome — at any rate, there have been no labour troubles as a result of women bosses.

Women in management and specialist technical positions in industry in the U S S R in 1957		
	Number of Women x 1000	Per cent of Total Employed
Total number of women managing and specialising made up as follows:	572	31
Directors, chief engineers and other senior technical personnel	13.1	10
Heads and deputy heads of organisational divisions of works and laboratories	44.9	26
Heads and deputy heads of factory shops	27	14
Shift supervisors and heads of production sections	17.3	24
Engineers	113.3	38
Engineer economists, economists, and production planners	45.0	74
Women in junior technical positions		
Technicians	85.7	59
Forewomen	97.1	21
Laboratory assistants	20.6	94

Children cared for

The argument that home-life suffers when women enter the professions seems to be unanswered. Creches, kindergartens, and boarding schools are playing an ever-increasing role in bringing up of young children. Husbands are expected to help as much as possible with the running of the home and most professional women are in the position of being able to employ domestic help.

Do women make good engineers? The triumph of Russian science and technology leaves little doubt of the answer.

The recent study made by the Caroline Haslett Memorial Trust has shown that women are successful in engineering work at all levels, that they are happy in the work and feel frustrated when they leave it.

It is tragic that women comprise only 0.1 per cent of the engineers in Britain!

Textile machine makers look ahead to the '70s

By our
Textile machine Correspondent

INCREASED throughput capacity, reduced maintenance requirements, and freedom from vibration are featured in new textile machinery designs.

Recent developments have produced some major improvements in the design of machinery for both the natural and synthetic fibre processing industries.

Economic considerations at home and overseas now demand maximum utilisation of installed equipment and peak operating loadings in order to minimise labour requirements and capital depreciation. At the same time there is a need to obtain a higher quality of finished yarn.

Technical emphasis in design has been centred on the fundamental aim of achieving higher throughputs with a minimum of maintenance.

This has raised problems associated with high speed, and even ultra-high speed, spindle operation, with attenuated quality control requirements. In some instances, in ring doublers and uptwisting machines, spindle-speeds in the region of 8,000 to 9,000 r.p.m. have been achieved.

New principles of power drive, and higher precision assembly techniques have been involved.

In addition, advanced and more stringently controlled methods of lubrication have had to be applied to ensure continuous, long-period operation under more arduous conditions.

This has usually taken the form of automatic pressure lubrication to the principal bearings and gear-units. Elsewhere self-lubricating or locked-in lubricant type bearings are applied; also in some instances nylon bushes have been fitted for smooth movement of the yarn.

Another direction in which throughput capacity has been improved is by increasing the take-up package capacity — in some cases by as much as 200 per cent.

In one particular new design of uptwisting machine, a maximum weight of 13lb. on the take-up capacity has been reached, with a 9lb. capacity on the twisting package. This is together with a spindle-speed up to 9,000 r.p.m., which has entailed designing to meet the high traversing loads and moments imposed by these increases.

The traverse in the above case is a totally enclosed unit with an extra heavy - duty, machined-groove cam. It is provided with automatic pressure lubrication and is machined to precision standards. All gearing is unit mounted in one main gear housing.

The cam itself is of large diameter, complete with pattern breaking mechanism and shock-absorbing slide-blocks direct coupled to the traverse rods.

A principal feature of this machine is the patent Flexa fully flexible spindle mountings which operate in a large capacity oil reservoir.

The complete high-speed spindle assembly is mounted in a heavy swing - arm, which contains a means for simultaneously disengaging the spindle and braking.

High-speed doubler

Of particular interest to the worsted trade is the introduction of a high-speed, narrow-width doubler. This is provided with a large feed roller with high-friction surface finish, ensuring accurate yarn throughput. Operating speed is 8,000 r.p.m. for a standard machine with 160 spindles.

An essential requirement for operation in the high range of spindle speeds is instantaneous breaking and yarn stop motion, or as near to this as can be achieved.

Rotary servo-mechanisms have been employed which instantaneously disengage both the feed roller and the spindle in the event of an end breakage. Single and false-doubling are also avoided by secondary stop motions in the event of breakage in the plied yarn zone.

In twisting machinery, the demand for high-throughput has been met by several recently introduced designs. One Scragg machine is a double-deck, double-twist uptwister for either synthetic or natural fibres. It will operate at twisting speeds up to 16,000 turns per minute, producing a knotless ready-for-sale package of up to 9lb. weight.

It has the advantage that it can process twistless, filament yarn or supply packages too heavy or too soft to be rotated at high-speed on conventional machines.

Take-up packages are positioned on specially suspended twin cradles with face drive against large-diameter driving drums. Nylon bush bearings are used to locate the mandrel, and there is an automatic off switch for cradle position control.

Special designs

Driving drum speeds are adjusted in relation to the traverse speed, in order to give accurate control of the density of the take-up package. Alternatively open-wind packages suitable for pressure dyeing can be proved by fitting an overfeed arrangement comprising full-length shafts with individual vee-feed wheels, the shafts driven and speed-controlled from the main drive unit.

The production of tyre cord yarn, whether two — three — or four-fold, has called for special design considerations. One outstanding example of this is the Aruncarder which produces yarn in one operation by using the uptwist and downtwist method. Ring and traveller mechanism is used for the downtwist. The uptwist spindles can be arranged in two rows to conserve floor space.

Almost certainly, the major future developments in textile machinery will be concerned with the high-speed production of man-made fibres.

According to certain authorities, world consumption of these products will continue to rise, especially in W. Europe. On this basis some far-reaching development programmes have been embarked upon. Notable in this field are the efforts of Ernest Scragg & Son of Macclesfield, who have already introduced five new machine designs in a proposed complete range of high throughput designs to be known as the 70s, since it is anticipated that peak requirements will be reached by the seventies.

Production of crimped yarn may reflect the greatest increased demand. In addition to ultra-high speed spindle operation is the dual problem of heat-setting and twist-insertion at these speeds. Quality-standard finish requires reliable and reproducable molecular re-orientation, necessitating operation at temperatures close to the melting point of the yarn.

Rapid heat transfer over unit area between the heaters and the yarn to ensure suitable yarn body temperature — right through to the core of the yarn — has to be provided. This is on a reduced time basis, to allow for the much increased velocity of throughput of the yarn.

Patent transistorised temperature control units (Tempic) have been devised. These give individual temperature control for each unit heater. The factors taken into account include the dwell-time in the heater-tube, yarn denier, and rate of propagation of temperature.

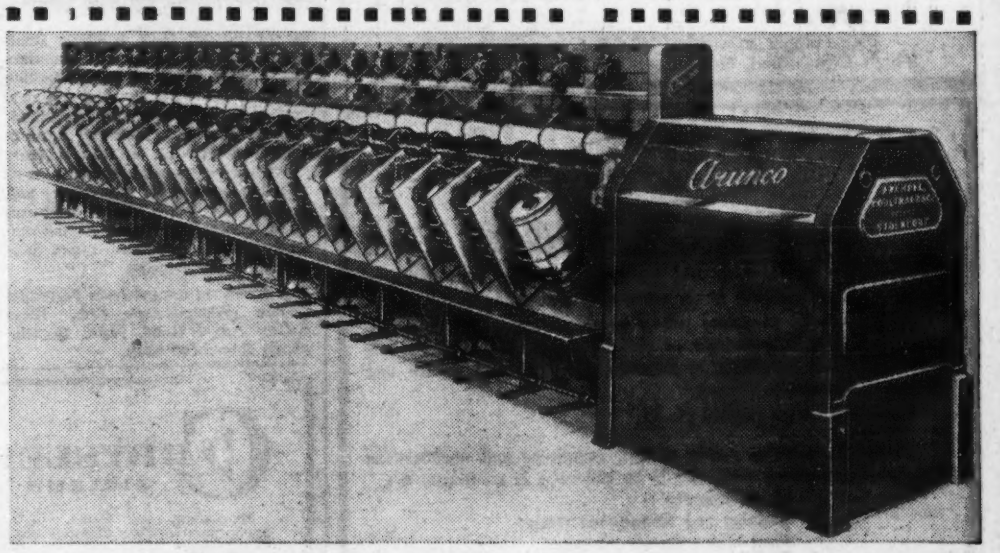
False-twisting also entails close control of yarn tension at the crimping stage to ensure consistency of quality. Close study has been made of this as a parameter of design as speeds have been progressively increased. Use has been made of rubber-covered nip rollers, with claims of as little as one per cent variation in relative speed.

Welded frames

In all new designs, high-speed operation has called for revised ideas on framework construction and bearing housings. Reinforced rigid steel side-plates and all-welded main frames with welded unitary main housings for gear units and sumps, traverse cam housings and so forth are generally featured.

In addition, low-built spindle rails for easier loading and overall compacting of assemblies has led to space saving and reduction of operator fatigue.

The above developments, plus the use of heavy-duty ball and roller bearings and anti-vibration mountings — particularly on spindles, motor bases, and traverses — have contributed to pronounced reductions in vibration. Some manufacturers claim virtually vibrationless performance.



The Arunco two-for-one twister.

NEXT WEEK

RADIOISOTOPES are being applied in many ways throughout industry—the uses include tracer techniques, activation analysis and bulk irradiation of products. Mr. W. G. Busbridge of the UKAEA's Wantage Research Laboratory has written an informative article — Radio-isotopes in Industry. This will appear in next week's issue.

Also next week Engineering News features an article on the use of tidal power as a source of energy. This is by the well-known technical author Mr. Rolf Hammond.

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Age 26-40. Minimum qualification of H.N.C. in Mechanical Engineering with good practical and design experience in works or marine fluids services, or boiler plant, chemical processes, etc., or medium to heavy process and production plant or mechanical handling plant.

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Please write in confidence, giving full details of qualifications and experience, to: **Mr. B. G. Tierney, Michelin Tyre Co. Ltd., Stoke-on-Trent, Staffs, quoting Ref. B/602/674/H/EN.**

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Candidates are requested to forward full details of experience and qualifications to:

Personnel Manager,
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Applications, quoting E.113, should be addressed to the Personnel Manager,

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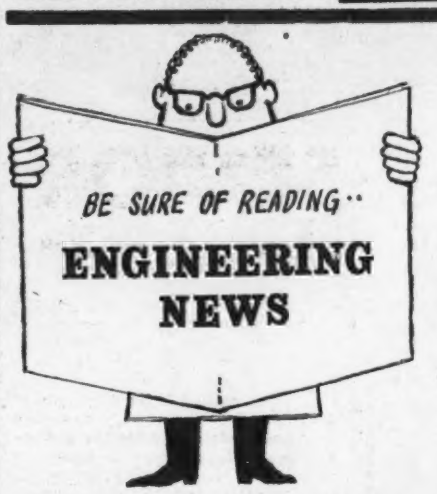

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Punched-tape operated drill in quantity production

A LOW-COST, numerically controlled drilling machine, the "Tape-O-Matic", is now being mass produced by Pratt & Whitney Co., of the Fairbanks Whitney Corp., New York, for world export.

The controls, and the machine itself, form a closed-loop servo system. The simultaneous positioning of both axes of the worktable is controlled by information on standard punched tape.

Floating zero

Dimensional information to the machine can be positive or negative, since the machine has a "floating zero" which allows it to operate in all four quadrants and enables the operator to set up and zero his workpiece anywhere within the travel limits of the table's working surface.

Cylindrical ways and recirculating ball-bearings are used to avoid static and dynamic friction. Backlash or lost motion at reversal points is eliminated by preloaded re-circulating ball-bearing nuts and feed screws.

The table working surface is 30 by 20in., and has longitudinal and transverse travels of 20 and 15in. respectively.

The position locating accuracy is $\pm$ (0.0005in.+0.0001*d*.), where *d* = distance in inches. Repeatability is $\pm$ 0.0005in.

Replacing machines

Explaining the reason for P and W's new line, Daniel C. McCarthy, executive vice president, said at the company's West Hartford, Conn., headquarters "In the past the price of numerical control has prohibited thousands of companies from replacing obsolete equipment. Our aim in designing the Tape-O-Matic was to produce a machine tool complete with highly-accurate control system at a price that would enable every company to 'get its feet wet' in numerical control."

The 1-in. wide tape can be easily prepared for most workpieces without the use of a computer. Dimensional information is tabulated direct from the blueprint and then punched into tape.

Advanced machines at Smithfield Show

AUTO-GEARED TRACTOR

Farmers welcome DB 990

AUTOMATIC transmission of a kind which could be used on commercial and passenger-carrying vehicles finds its first use in a farm tractor now in production. The tractor, the David Brown 990, was one of the highlights of the Royal Smithfield Show, which opened on Monday at Earls Court, London.

For years farmers have wanted a farm tractor with an automatic drive. To introduce some form of hydrostatic or hydrokinetic transmission, which is an obvious way of tackling the problem, would mean a radical change in standard tractor design—and standardisation is the basis of tractor production.

Two speed ranges

Now, however, a simple form of automatic transmission, partly hydraulic, mostly mechanical, has been produced to overcome these problems.

Built into the standard 52 b.h.p. 990 tractor by David Brown Tractors, of Huddersfield, it gives two forward speed ranges, from 1 to 16 m.p.h. for harvesting, ploughing and the like, and from 4 to 16 m.p.h. for light transport and road work.

When in use the driver sets a dial to "automatic" and then engages a selected speed range.

The system selects the lowest speed ratio on starting from rest, thereby reducing the load on the transmission; and then changes automatically to the most efficient working speed possible according to load and ground conditions.

Air-cooled engines

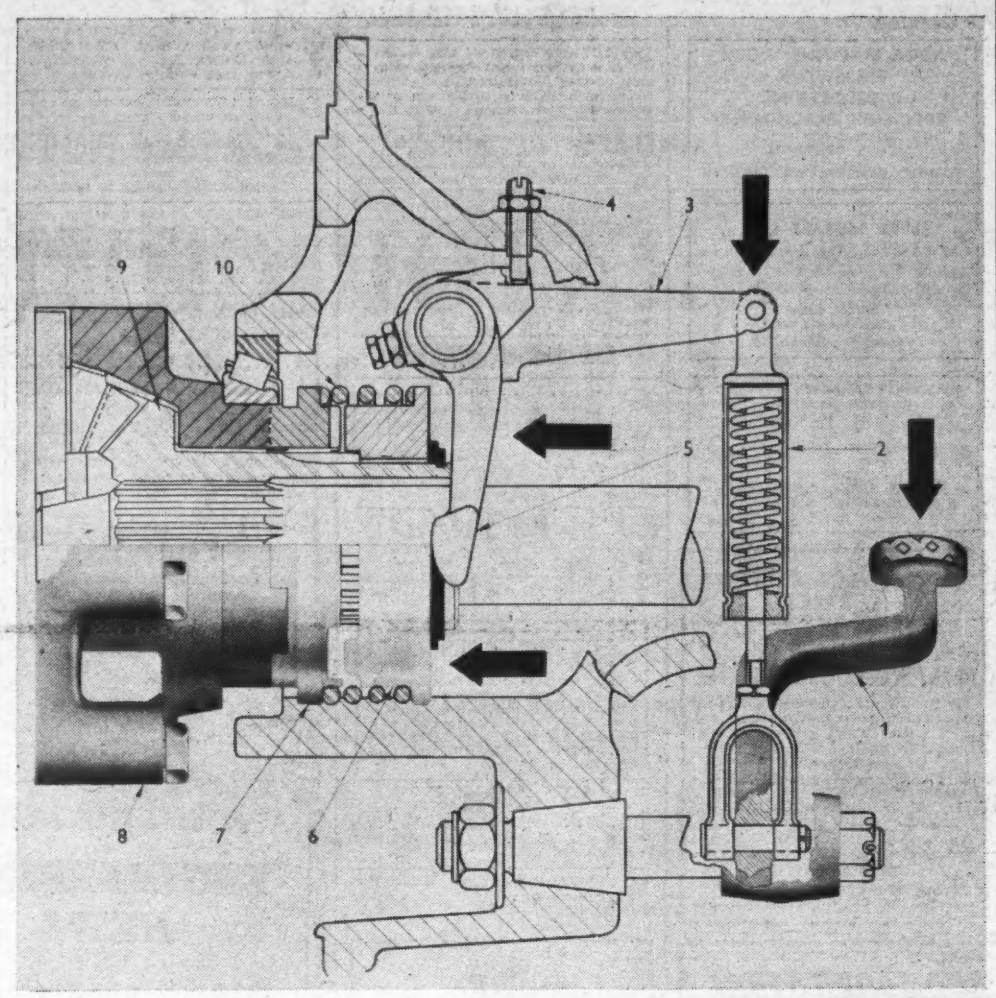
Among tractors new to the Show were a number of German air-cooled diesel tractors. Made by Klockner-Humboldt Dentz of Cologne they range up to 65 h.p.

More midget tractors and cultivators than ever were shown. These can be used for all forms of cultivation except the heaviest; their engines can be used to drive pumps, saws, sprays, and so on, and the newest have trucks of up to half a ton capacity (Auto Culto International, Ltd., Reading).

Among changes in tractors is that in the Fordson Dexta. Better traction on slippery ground is now provided by the fitting of a foot-operated differential lock. This makes it possible for the driver to cut out the differential action of the rear axle shafts, so obtaining the effect of a combined pull from both wheels.

Failure of fuel injection equipment is often caused by corrosion and wear resulting from the presence of water and abrasive matter.

CAV were showing what they call a filter-agglomerator-sedimenter unit which passes oil containing water through a filter. This makes the oil coalesce and the larger droplets are removed by sedimentation.



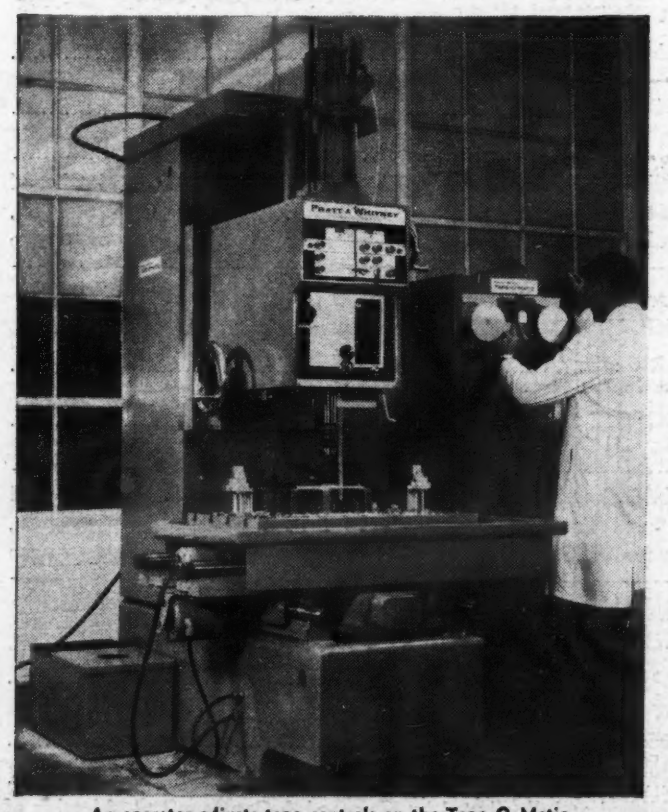
Cross-section of the Fordson differential lock: 1, operating pedal; 2, spring-loaded operating rod assembly; 3, operating lever; 4, adjusting screw; 5 operating fork; 6, sliding coupling; 7, adaptor; 8, differential case; 9, R.H. side gear; 10, return spring.

HIGH PRESSURE CUT-OFF VALVE

AN automatic shut-down valve for the protection of hydraulic and pneumatic circuits with operating pressures of from 100lb./sq. in. up to 4,000lb./sq. in. has been developed by I.V. Pressure Controllers of Isleworth, Middlesex.

It has a dome-like upper chamber separated from the valve by a diaphragm which operates a poppet valve to shut off the circuit when pressure fluctuations occur.

Closing time is about 0.7 sec.—less when subject to surge—and the valve weighs only 1¼lb. and has a diameter of 1½in.



An operator adjusts tape controls on the Tape-O-Matic.

CONTROLS TEST FOR TRIDENT

HYDRAULIC power control units of the type to be used in the D.H. Trident three-jet airliner are undergoing 30,000 hours of simulated flight tests in the Hydraulics Division of Fairey Engineering at Heston, Middlesex.

Testing is carried out in specially designed rigs in which the control units are operated as nearly as possible under typical flight loading.

The various control movements normally initiated by the pilot are selected by an electro-hydraulic positioner. This enables a complete test programme to be set up on cams with a master control unit switching from one cam to another on either a "time" or "number of operations" basis.

Safety devices are incorporated so that in the event of mechanical, hydraulic or electrical failure the rigs will automatically close down.

Before being accepted for flight, all aircraft equipment of new design or of established design for new application, is subjected to tests of this type.

IEC sets up committees

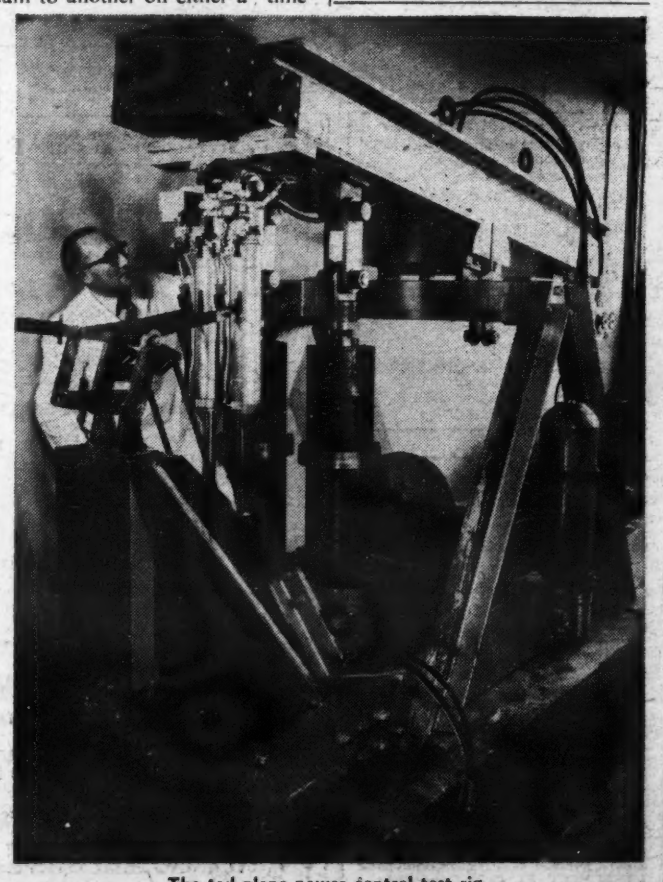
ELEVEN technical committees and sub-committees of the International Electrotechnical Commission held meetings within 12 days last month at British Standards House, London.

About 160 delegates from 17 member nations of the I.E.C. attended. Meeting for the first time under the secretariat of the U.S.A., a new technical committee on computers and information processing authorised the setting up of four sub-committees.

The first will deal with digital input—output equipments with regard to standardisation of electrical characteristics.

The second will look into standardisation of electrical characteristics for digital data transmission.

The third and fourth will cover analogue equipments and input-output media.



The tail plane power control test rig.

LATE NEWS

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* From front page

Power link

current would have been needed since the cables act as capacitors

On d.c., a line can operate at a higher voltage for a given amount of insulation and it requires only two conductors instead of three.

However, one difficult problem presented by a direct current system is the conversion to a.c. supply.

For the cross-Channel link large mercury arc valves have been installed as invertor/converters.

Swedish valves

They were developed by Dr. Uno Lamm for the Swedish State Power Board for a d.c. link between the island of Gotland and the Swedish mainland.

The mercury arc valve, when acting as a rectifier, blocks one half of an a.c. wave and allows current to flow in one direction.

Without any form of grid control the valves would carry current when, in the voltage cycle of the a.c. applied, the anode becomes sufficiently positive to permit firing.

Voltage control

If a grid is introduced, together with control voltages, firing can be prevented or delayed within the cycle, so the voltage applied to the d.c. circuit may be controlled.

By further delaying the firing point in the cycle the d.c. voltage can be reduced to nothing, while even further delay changes its direction and it becomes negative.

This means that the polarity on the d.c. side has become reversed, although the current still flows in the same direction, as it can only pass through the valves from anode to cathode.

Therefore, the direction of the power-flow has been reversed and one set of valves at one end of the cross-Channel link becomes an invertor, transforming to a.c.

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